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Cloacal Morphology

IN ITS

Relation to Genito-Urinary and Rectal Diseases

(*With 54 Plates and 93 Illustrations*)

BY

BENJAMIN MERRILL RICKETTS,

Ph. B., M. D., LL. D., F. A. C. S.

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Member American Medical Association; (House Surgeon N. Y. Skin and Cancer Hospital, 1884-5); Ohio State Medical Society; Western Surgical and Gynecological Association; International Medical Congress, 1887; International Association Railway Surgeons; Mississippi Valley Medical Association; Cincinnati Academy of Medicine; Honorary Member Medical Society State of New York; Honorary Member St. Louis Medical Society; Fellow New York State Medical Association; Member Societe Internationale de Chirurgie; American Urological Association; American Proctological Society; Cincinnati Society of Natural History; Pan-American Congress; Honorary Professor of Surgery of the Thorax and its Viscera; Barnes and American Medical Colleges; National University of Arts and Sciences, St. Louis, Missouri, and Clinical Congress of Surgeons of North America; Author of Volumes What to Do in Case of Accident; Surgery of the Prostate, Pancreas, Diaphragm, Spleen, Thyroid and Hydrocephalus, Surgery of the Ureter, Surgery of the Heart and Lungs and Surgery of the Thorax and Its Viscera; Founder and Director of the B. Merrill Ricketts Experimental Surgical Research Laboratory, Cincinnati, Ohio, etc., etc., etc., etc., etc., etc., etc.

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This work is dedicated to HOWARD AYERS, B.S., Ph.D., L.L.D., Morphologist and Advocate of Scientific Research.

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Everything has a beginning, an existence, and an ending, with changes of equal interest and importance. It is therefore necessary to become familiar with creation that existence and dissolution may be better understood.

The thing created should be more perfect than its creator, its existence superior and its dissolution more natural, but there are errors and variations evidenced upon every hand, among them changes in the cloaca which are herein considered. (B. M. R.)

INTRODUCTION.

For fifteen years the anatomical relation of the perineum, coccyx, uro-genital and rectal tracts has been attractive to me, especially symptomatology, which so much concerns them and which is so much in doubt. But not until a more recent time, when the importance of the pudic nerve and its many changes in distribution resulting from changes in the cloaca to form the perineum were suggested, was I convinced of the great similarity of physiologic symptoms due to their anomalies, diseases and injuries, and now at the conclusion of this research, I find this thought crystallized into one more certain and enduring.

Especial attention has been given to the pudic nerve, lymphatics, Glomus coccygea, coccyx, Cowper's and Bartholin glands, because they play a more important rôle in symptomatology than has ever been ascribed to them.

With the exception of the Glomus and Coccyx, no form of treatment is considered throughout this work. I have quoted freely from many authors, not only in histology, but in the general text, because I felt my incompetency and because time would not permit of a more general research. If therefore, I have been permitted to reflect only a delicate ray of light upon this suggestion, the purpose of this work will have been served.

I desire to thank Dr. D. D. DeNeen for his assistance in preparing the work on the lymphatics, Miss Gladys Ayers and Hawley Zwick for photographic illustrations, Miss Ayers for copy, my students Miss Nevada Hannah and Mr. R. A. White for assistance in the preparation of the copy, Drs. Sappy, Cuneo, and Marcille, Deaver, Piersol, Kelley, Schumacher, Jakobsson and others for permission to use illustrations and quote text. I also want to express my deep appreciation to Mr. Howard Ayers for his contribution, valuable suggestions and encouragement in this research, and to the A. R. Fleming Printing Company for producing the book in a form so pleasing.

BENJAMIN MERRILL RICKETTS,

February 14th, 1915.

N. W. Corner Fourth and Broadway,
Cincinnati.

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CHAPTER I.

A Summary of the Development of the Rectum and Urinogenital Sinus from the Cloaca.

CLOACAL-COCCYGEAL HISTORY.

By

HOWARD AYERS.

IN VERTEBRATE anatomy the term cloaca is applied to the common chamber into which, in many forms, the intestine, the ureters and the genital passages discharge.

Reptiles and birds all possess a cloaca generally well developed. Since both birds and mammals are descended from the reptilian stock by divergent paths of development we would expect to find traces of such an important organ as the cloaca in the mammals also.

Living in Australia today, we find two primitive mammalian forms, the duck-bill (Ornithorhynchus paradoxus) and the spiny ant-eater (Echidna hystrix). Both of them are egg-laying mammals—laying eggs like a reptile or bird and after hatching the eggs in their abdominal pouches, nourishing the young with a milk secretion from rudimentary or better—primitive milk glands. They are clearly transitional forms between the reptilian stock and the mammalian stock. These two forms are classed as Monotromes because they have only one external opening for voiding the contents of intestine, ureters and genital tubes. They are cloacal mammals and the cloaca is preserved in reptilian perfection. While none of the higher mammals normally possess a cloaca in the adult state, all of them pass through a stage in embryonic growth in which the cloacal apparatus is fully developed. However, before the permanent condition is reached the cloaca is generally obliterated as a common chamber and it becomes separated into two tubes, one for the reception of the intestine, the other for the ureters and the genital canals.

This separation always occurs, except when the developmental processes are interrupted or inhibited. Such inhibitions do occur and that not infrequently. They may occur at various stages in the growth of the parts—such individuals we call abnormal—we can only mean that there has been an arrested or thwarted development of the parts. For example, in the human female we occasionally find a double vagina—a normal marsupial condition or again we may find the ancient and normal reptilian.

In the human male we not infrequently find a condition of the erectile organ which we term hypospadia. Hypospadia is nothing more or less than the normal condition of the erectile organ in the Monotromes. Various other conformations which we call deformations when we find them in man are simply due to the persistence of normal conditions of the parts as found in ancestors of the stock.

The persistence is due to some check in the evolutionary growth of the human individual.

Let us now examine the embryology of the cloacal region in man.

In the human embryo of fifteen days' growth, the cloaca is well formed. The opening of the urinogenital sinus and the intestine are still confined to the common chamber. The cloacal tubercle is prominent and lies in the center of the quadrangle formed by the leg pads, the coccygeal tubercle, and the umbilical cord. Soon, however, changes begin in the cloacal aperture into the definitive anus and the urino-genital sinus or pore. Two folds of the lateral walls of the cloaca grow towards each other, until they meet and coalesce, thus forming the perineum. The proctodaeum breaks through into the lumen of the gut, and the cloaca, as such, is no more. These changes are completed

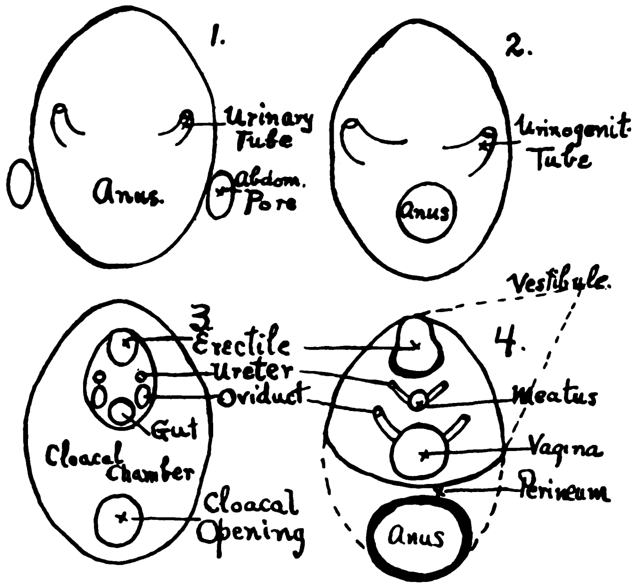

Plate 1.—Evolution of the Cloaca.

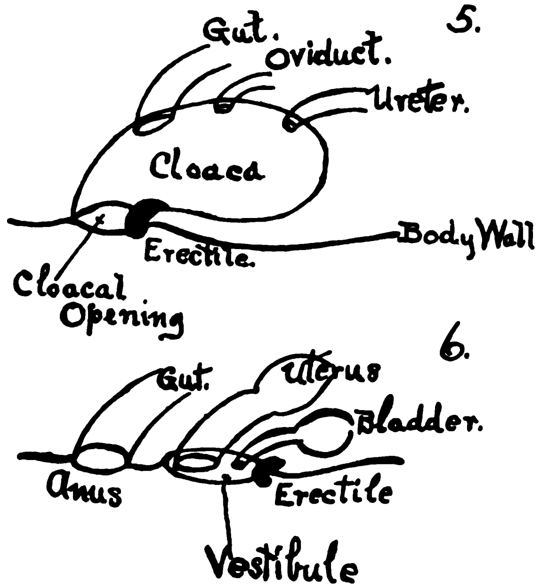

Plate 2—Evolution of the Cloaca.

about the end of the fifth week. There is, however, a short time during which the human embryo possesses a true cloaca.

We have spoken only of the walls of the cloaca. Of course all other structures such as blood-vessels, nerves, and muscles are involved in these transformations, so that in the study of the cloacal region of the adult human we must bear in mind that all the structures have an ancient pedigree. For example the old-time Musculus Sphincter Cloacae is separated into M. sph. Ani. Ext. and M. sph. Urogenitalis.

The nervous pudendus breaks up into branches supplying the lower rectum and anus and urethra and erectile organs, each branch receiving an appropriate name in the terminology of human anatomy.

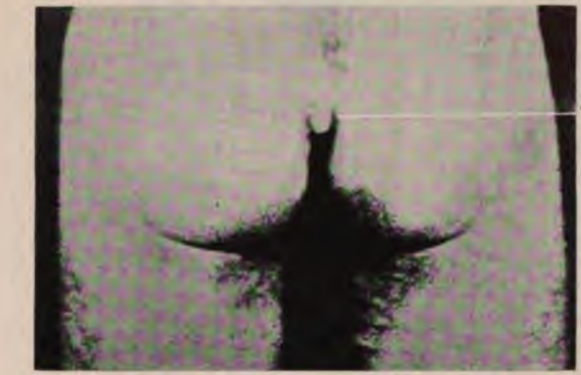

Fig. 2.—Tailed Man.

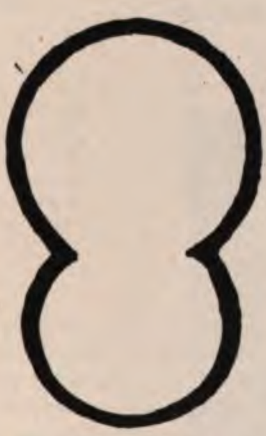

Fig. 3—Cloaca of Rabbit.

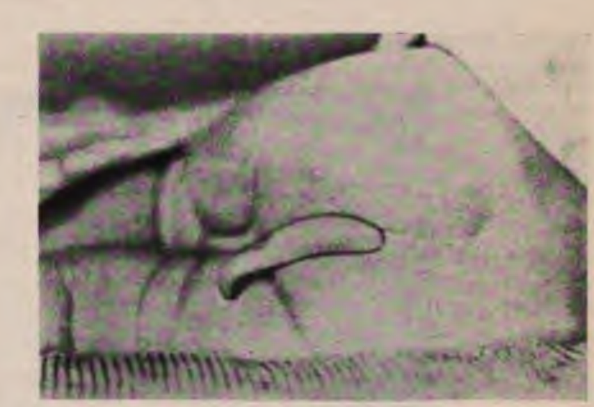

Fig. 4.—Showng tail extended. (*Johns Hopkins Bulletin.*)

M. Sph. Cloaca
- 1. M. Sph. Ani. Ext.
- 2. M. Sph. Urogenit.
  - *a.* M. bulbo cavernosus
    - (a) M. transversus perinei.
    - (b) M. urethralis.
  - *b.* M. ischio cavernosus.

In the rabbit for example, we have an intermediate stage in the separation of the cloacal muscle into its parts—for here the division is not complete and neither sphincter forms a ring—but the two together an open-jointed figure eight.

CHAPTER II.

PERINEUM.

ANATOMY.

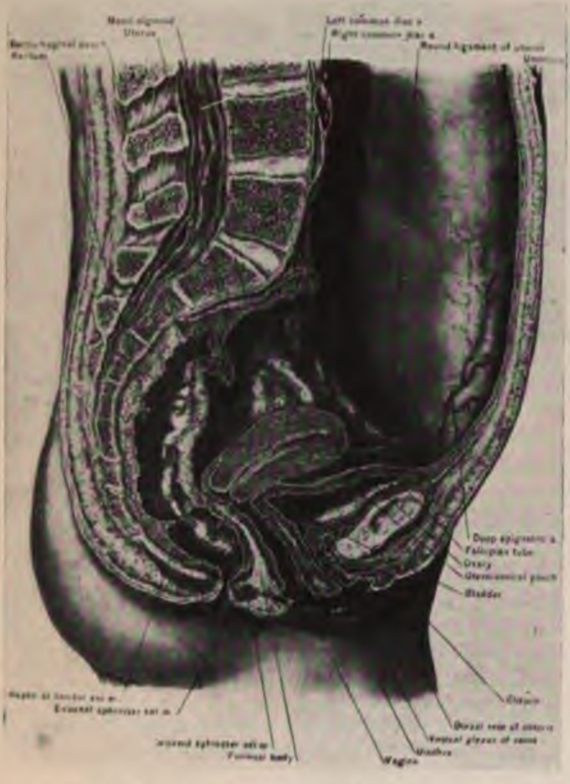

Fig. 10.—Female pelvis and perineum—sagittal section (Deaver).

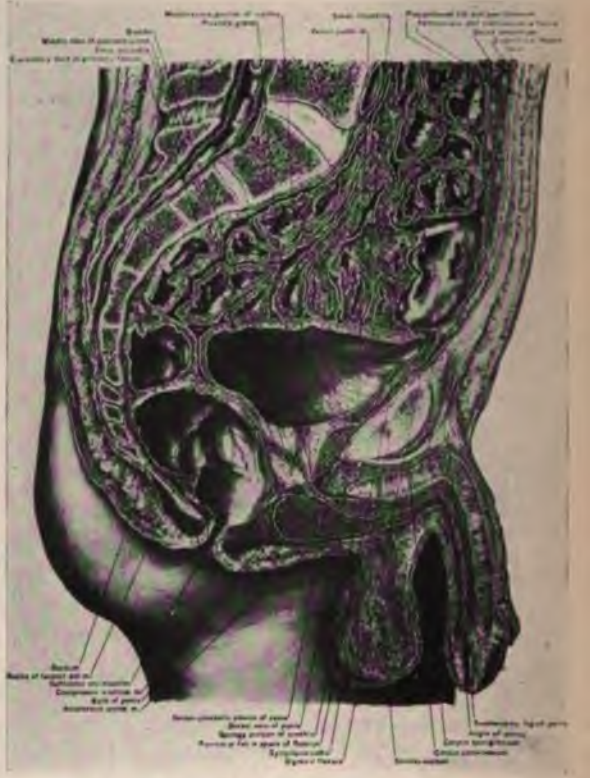

Fig. 11.—Male pelvis and perineum—sagittal section (Deaver).

Anatomy of the Perineum.
Superficial and Deep Tissues of the Perineum.
Superficial.

1. Cutaneous.
2. Fat.
3. Fascia, superficial and deep.
4. Blood vessels.
5. Nerves.
6. Lymphatics.

Deep.

1. Sphincter ani externus.
2. Transversus perinei superficialis.
3. Bulbo cavernosus—or Erector penis and clitoris.
4. Ischia cavernosum.
5. Compressor Urethrae, beneath the triangular ligaments.

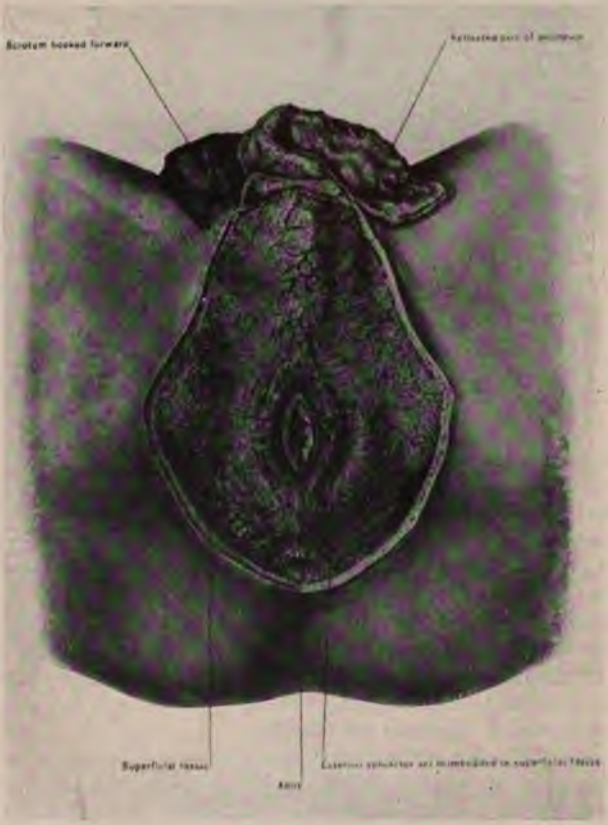

Fig. 12.—Superficial fascia of male perineum (Deaver).

THE PERINEUM is of recent origin in the history of animal life and found only in mammals, being absent in fish, reptiles and birds and as has been stated, absent in a few mammals, for example the rabbit.

The perineal body lies between the vagina and rectum with the base pointing downward, one inch antero-posterior in diameter and one one-half inches in height, but it may vary in size in individuals of the same kind. In the male it is supplied by the internal pudic and inferior hemorrhoidal vessels; while in the female the blood supply is from the iliac artery. It is inhibited by the pudic and small sciatic or pudendal nerves and its lymphatics empty into the inguinal glands.

There is no part of the body possessing so great a variety of organs and tissues as the perineum and its intimately associated structures.

Tissues and organs entering into the structure of and most concerned in the formation of the perineum, any one of which by reason of anomaly, disease or injury, may cause subjective symptoms alone or combined, because of insult to one or more branches of the pudic nerve, are classified as follows:

Perineum	Coccyx	Urinary	Genitalia	Rectum
Cutaneous Fat Fascia Muscles Tendons Ligaments Bones Blood vessels Nerves Lymphatics	Bone Periostium Glomus-Coccygea	Urethra Bladder Ureters Kidneys	*Male* Penis Prostate Cowper's glands Testicles Spermatic ducts Scrotum *Female* Vagina Bartholini glands Clitoris Uterus Ovaries Tubes	Sphincter ani Rectum Sigmoid

Cutaneous structures reveal as objective the presence of induration, tenderness, color, and subjective such as pain, location, temperature, loss of appetite, general depression and reflected pain, distal to the perineum.

Fat is deposited within the integument and external to the superficial fascia and more or less about the muscles.

The fascia in the perineum is both superficial and deep.

The superficial is a continuation of the superficial fascia of the abdominal wall, thigh and buttocks and extends over the pelvis and scrotum. In the scrotum it is intermingled with involuntary muscular fibers and forms the dartos muscle which assists in suspending the testicles and corrugating the skin of the scrotum. It also forms the septum of the scrotum which separates the testicles.

The fascia over the posterior portion of the perineum fills up the ischio-rectal fossae in the form of two pads of adipose tissue on either side of the rectum and anus, while the fascia of the anterior part of the perineum resembles the same fascia in the groin. The deeper layers are attached to the pudic arch posteriorly to the base of the triangular ligament and in the middle line to the root of the penis (bulbus and corpus spongioseum) and median line of the scrotum. The fascia is continued anteriorly over the spermatic cords to the anterior abdominal wall, and its function is to prevent pus and extravasated urine passing backwards into the ischio rectal fossa or laterally into the thigh. It is directed forward into relation with the scrotum and penis and along the spermatic cord to the anterior abdominal wall. The septum of the scrotum being incomplete, fluid extravasated on one side according to Cunningham can pass across the middle line to the opposite half of the perineum and scrotum.

The deep fascia of the perineum is only a delicate aponeuroses of the muscles.

The superficial perineal artery arises in the anterior part of the ischio rectal fossa, pierces the base of the triangular ligament, and divides into long slender branches (scrotales in the male, labiales posteriores in the female) which are continued forward in the urethral triangle, beneath the superficial perineal fascia, to the scrotum. It anastomoses with its fellow of the opposite side, with the transverse perineal and the external pudic arteries, and supplies the muscles and subcutaneous structures of the urethral triangle.

The superficial transverse perineal muscle is not always present in the form of a small delicate bundle of fibres arising from the ascending ramus of the ischium and the fascia over it, and forms the base of the triangular ligament. It is directed inwards and forwards to be inserted into the central point of the perineum and conceals the base of the triangular ligament.

The transverse perineal artery is a small branch which arises either from the internal pudic or from its superficial perineal branch. It runs inward along the base of the triangular ligament to the central point of the perineum, where it anastomoses with its

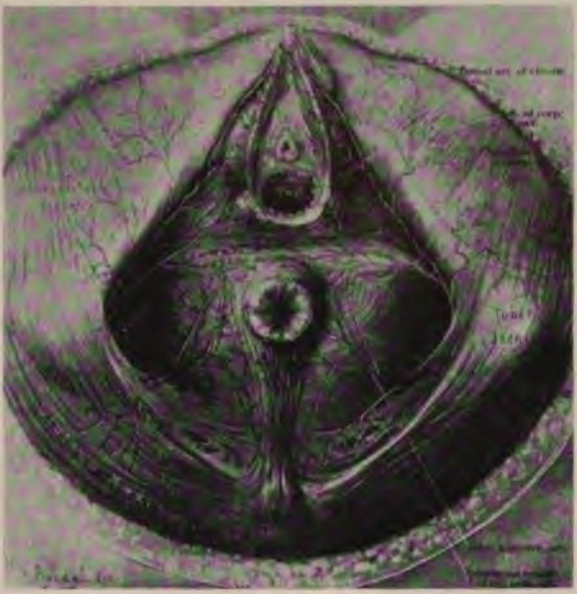

Fig. 13.—Superficial dissection of the perineum (Kelley).

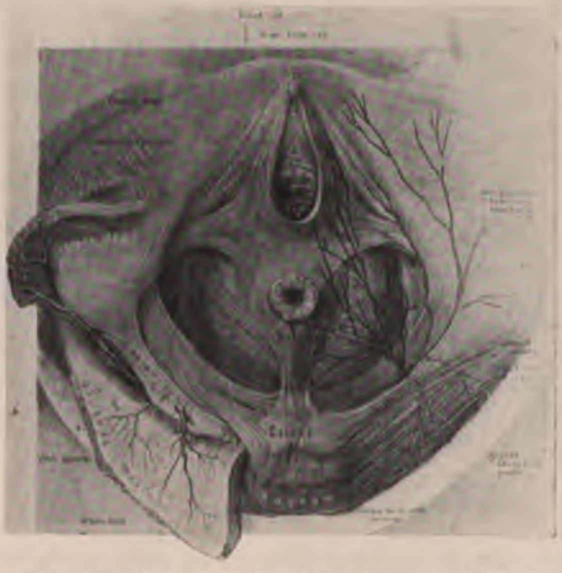

Fig. 14.—Deep dissection of the perineum (Kelley).

fellow on the opposite side, with the superficial perineal branch and with the interior hemorrhoidal arteries. It supplies the sphincter vaginae, and the anterior fibers of the levator ani.

The nerve supply is from the perineal branches of the pudic nerve and its function is to assist the deep transverse perineal in fixing the central tendon of the perineum during the contraction of the bulbo cavernosi.

The transverse perinei profundi muscle arises from the ascending ramus of the ischium just below the compressor urethra and is inserted into a median raphe, continues with that of the compressor urethra in the form of two separate bundles of fibers one below and the other behind the compressor urethra. Its function is to fix the central tendon of the perineum during the contraction of the bulbo cavernosus. Some of its fibers unite with those of the superficial transverse perineal muscle.

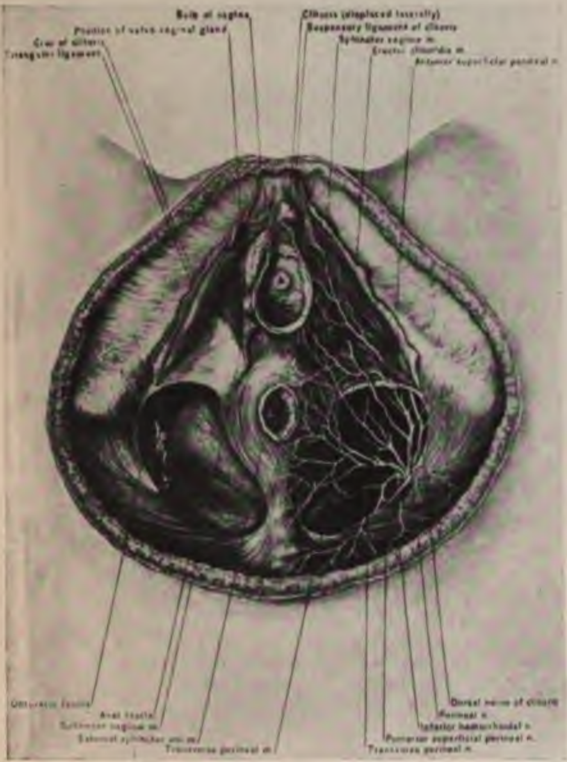

Fig. 15.—Triangular ligament and superficial perineal interspace of female (Deaver).

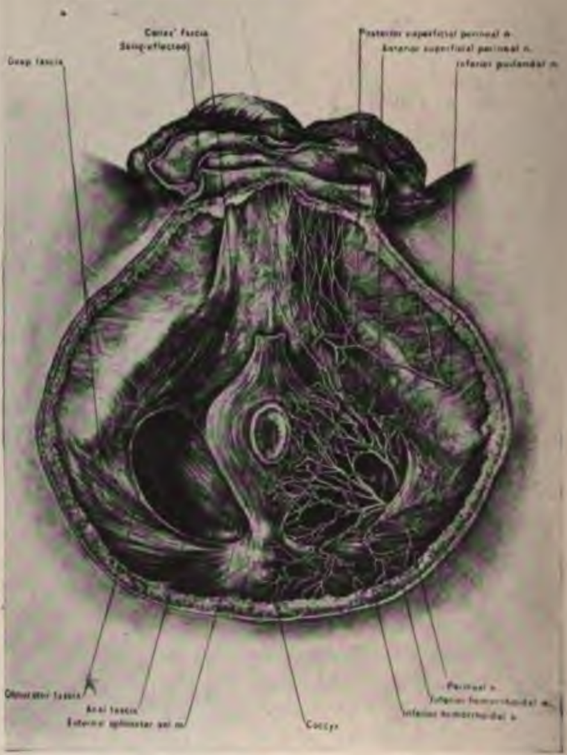

Fig. 16.—Ischio-rectal fossæ and fascia of colles of male perineum (Deaver).

Its *nerve supply* is by a branch of the pudic which breaks up into many fine twigs, branches of the fourth sacral nerve.

Deep muscles of the pelvic floor.

1. Levator ani. (See rectum.)
2. Obturator internus.
3. Pyriformis.
4. Coccygeus. (See coccyx.)

Obturator Internus arises by fleshy fibers on the pelvic aspect of the hip bone and posteriorly opposite the small sciatic notch and, like the obturator externus, is fan-shaped.

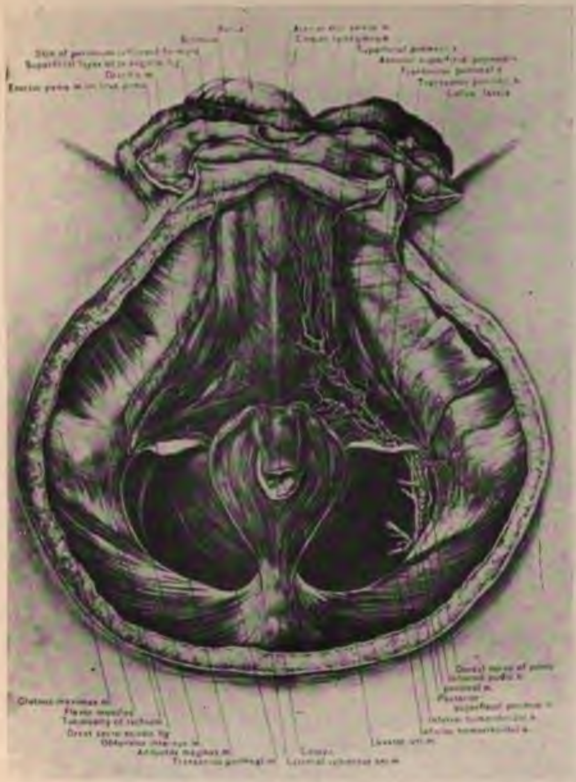

Fig. 17.—Superficial muscles, arteries and nerves of male perineum (Deaver).

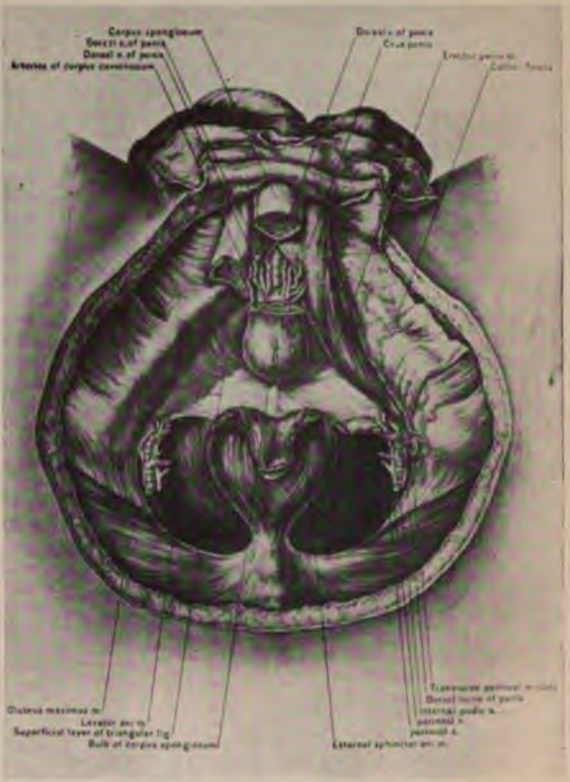

Fig. 18.—Superficial layer of triangular ligament of male perineum (Deaver).

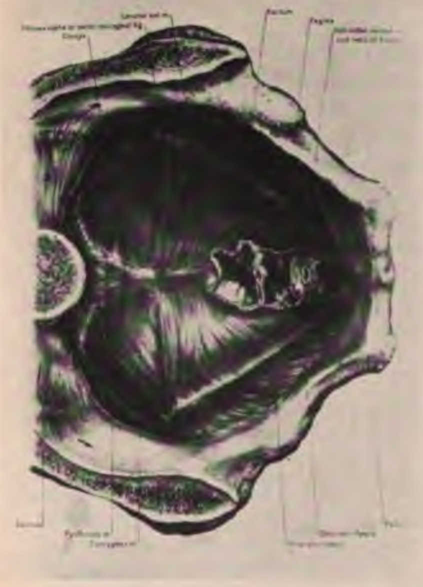

Fig. 19.—Muscles in floor of pelvis—superior view (Deaver).

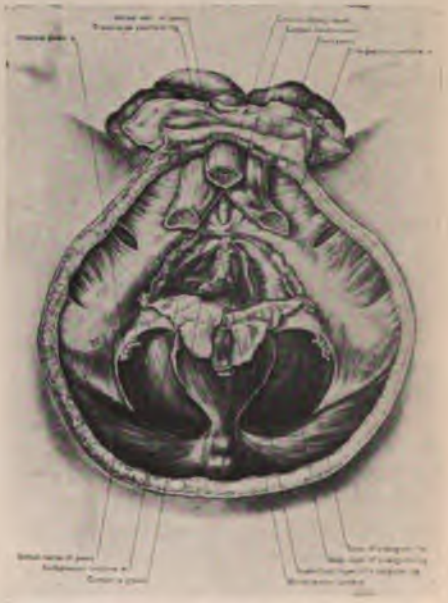

Fig. 20.—Triangular ligament and compressor urethræ muscle (Deaver).

It is separated from the pelvic contents above by the peritoneum and below by the base of the ischio-rectal fossa and is crossed by the internal pudic vessels and nerve in the outer wall of the fossa in a special sheath of fascia.

Pyriformis muscle arises within the pelvis between the first, second, third and fourth sacral vertebrae, and from the adjacent part of the bone external to the anterior sacral foramen. Passing out through the great sacro sciatic foramen it receives an origin from the upper margin of the great sciatic notch of the ilium and from the pelvic surface of the great sacro sciatic ligament, forming in the buttocks a round tendon which is inserted into a facet on the upper border and inner aspect of the great trochanter of the femur partly surrounding the insertion of the obturator internus. It lines the posterior wall of the pelvis lying behind the rectum and is covered by a thin layer of the parietal pelvic fascia. It is a muscle of abduction and flexion.

The first and second sacral nerves supply the pyriformis muscle which arises from the sides of the sacrum between the first, second and fourth foramina, and which is inserted in the upper margin of the great trochanter.

ETIOLOGY.

Disease
- Anomalies.
- Benign.
- Malignant.
- Injury.

ANOMALIES.

ANOMALIES may be congenital or acquired, primary or secondary, single or multiple, absent in part or entirely, the result of defective development, accident or design and involve any of the adjacent tissues or cavities.

The causes of symptoms relating to the perineum, like those in other regions, may be physical or functional and of anomalous, pathologic or traumatic origin. It is therefore necessary to review them briefly that their relations may be better understood, and because the object of this work is to associate physiologic symptoms and their respective causes, such as pertain to the perineal tissues and their intimate, associated organs, it will be necessary to consider them separately.

Anatomical variations may be due to defective embryonic development or defective development after birth, the result of paralysis, disease, injury or surgical operation.

Variations from normal in the soft structures, may be of such a character as to partially or completely destroy mechanical function, such as urination, defecation, impregnation and delivery of the products of impregnation.

They may also destroy physiologic functions which result from defective blood, nerve and lymphatic supply and bony structures, like the coccyx, sacrum and pelvis, may possess such mechanical defects.

Any one or all of these will cause symptoms varying in character.

Pathologic changes result from acute or chronic diseases, due to infection or accidental or induced trauma.

Conditions of any character in any of the perineal structures or organs produce symptoms which may or may not be significant with or without recognition of the lesion.

Physiologic changes may be due to anatomic, pathologic or traumatic conditions, one or all combined, or they may be due to changes in the nervous system independently.

Defective blood, nerve and lymphatic supply not infrequently disturbs physiologic function. Secretion and excretion may be increased or diminished in amount and then materially changed and remain unrecognized. This function may be affected for a few minutes or it may be hours, days, weeks or months or it may be permanent.

Traumatic changes are the result of repair following infections and accidental or surgical injuries.

They occur quite frequently with more or less loss of tissue and function due to cicatricial tissue.

This is especially exemplified with injury to the penis and testicles with their associated ducts and the uterus with its appendages.

Surgical operations may change anatomical relations with or without interfering with function.

Such trauma for the correction of anomalies, diseases or injuries is not without its effects, and while it is often necessary, the degree of restoration to normal varies, occasionally it fails, while in others it is only a partial success, but fortunately the great majority are complete restorations or as near to normal as it is possible to obtain, but in either event certain symptoms may result.

DISEASES.

Benign. Malignant.

BENIGN.

Papillomata may be congenital or acquired, primary or secondary, usually pedunculated, single or multiple, vary in size, shape and location, cease, continue to grow, disappear spontaneously, upon the mucous or cutaneous surfaces and more frequently at or near the muco-cutaneous border.

(See for all chapters, Papillomata and Adenomata: Historical Review (Ricketts), *Amer. Jour. of Dermatology*, March and April, 1908. Also *N. Y. Med. Jour.*, Vol. LXXX, 1907.)

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and in any portion or tissue of the perineum.

Tuberculosis may be primary or secondary, single or multiple, acute or chronic, in any tissue or portion of the perineum, probably more frequent at the vaginal or anal border, cease or continue to destruction, or disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, vary in size in the superficial or deep perineum, more frequently primary, in the form of a chancre. The primary form occurs more frequently in the female than the male perineum, because of the additional amount of mucous membrane in the female, but it may occur in any of the perineal structures.

Osteomata may be congenital or acquired, primary or secondary, single or multiple, vary in size and location.

They seldom occur in the perineum except when they originate in the periosteum or the attachments of tendons, and are usually single, round or irregular in shape.

Chondromata may be congenital or acquired, primary or secondary, single or multiple, vary in size and location, characterized by their development from cartilaginous tissue, found in the attachments of tendons, about bony structures, and almost invariably single.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size or location, and result from degeneration of any neoplasm or injury. Those congenital may be dermoid or contain blood, pus, or serum, and the acquired contain fluids of the same character, and echinoccocci. Any variety may rupture externally, into the vagina, rectum, bladder, uterus, urethra, or peritoneal cavity.

Fistulae may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size, length and location, irregular in their course, traverse the superficial or deep perineal structures, originate in them and open upon the cutaneous structures after having connected the rectal, vaginal, uterine, peritoneal cavity, or urinary tract, one or all, at the same time. One or more channels may connect with one opening without either of these tracts being involved.

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, usually primary and single in any tissue or portion of the perineal body.

Sarcomata may be primary or secondary, single or multiple, usually primary and single, in any portion or tissue of the perineum.

INJURIES.

Lacerations, incisions, punctures, contusions are the result of accident or design, may be primary or secondary, single or multiple, complete or incomplete, with ragged or sharply defined edges, complicate the rectum, vagina, uterus, urethra, bladder, prostate, peritoneal cavity or any of their associated structures.

Foreign bodies may be made to enter the perineum by accident or design, from without or through the rectum or vagina, remain indefinitely, by becoming encysted, or escape through the cutaneous structures into the urethra, bladder, rectum, vagina, uterus or peritoneal cavities.

SYMPTOMS.

Symptomatically the perineum is perhaps first in interest in non-visceral anatomy, because of the numerous conditions within the urogenital and rectal tracts, three of the most important channels within the realms of surgery. The intimate relations of these organs during the cloacal period and their separation by the formation of the perineum, which wrought so many anatomical changes, continues to be of interest worth while, especially because the purport of certain nervous impulses is yet undetermined.

To symptomatology will credit probably be given for whatever great advance is made within the next decade in the correction of beginning changes.

Three teachings of pathology within seventy-five years and as many of physiology, would indicate their great uncertainty and difference between living and dead pathology and that physio-symptomatology would seem most likely in importance.

Symptoms must be determined and classified before an advance can be taken, whether they be due to anatomical, pathological, physiological, or traumatic conditions. Anatomical are first and most important to know, before the cure of those pathologic or physiologic are attempted with any assurance of success. Those physiologic are dependent upon anatomic, pathologic and traumatic conditions, one or all combined.

CHAPTER III.

Etiology. Symptoms. Diagnosis.

GOULD'S DEFINITIONS.

"ETIOLOGY is the science of efficient causes."

"*Anomaly.* Any deviation from the normal or typical structure or occurrence. It may be congenital or acquired, accidental or induced."

"*Disease.* A condition of the body marked by inharmonious action of one or more of the various organs, owing to abnormal conditions of structural change."

"*Injury.* Any damage or harm to the body or any of its parts."

SYMPTOMS.

GOULD'S DEFINITIONS.

Semieology is the science of signs; in medicine of the symptoms of disease.

Symptom. A coincident happening, change or phase which occurs synchronously with a disease and serves to point out its nature and location.

Indirect Symptom. One only indirectly due to disease.

Negatively Pathognomonic. One which occurs in a certain disease and therefore by its absence shows the absence of that disease.

Pathognomonic Symptom. Is one which exhibits itself only in a certain disease and therefore undoubtedly proves itself.

Physical Symptoms. Are the physical signs of morbid conditions.

Static Symptom. Is one which indicates the condition in a single organ without reference to the rest of the body.

Subjective Symptom. Is that observed only by the patient.

Objective Symptom. Is one observed by the physician.

The Sympathetic Symptom. One for which no adequate cause can be given, other than so-called sympathy.

Symptoms.

1. Local.
2. General.

    Local.

    1. Tenderness.
    2. Tumefaction.
    3. Color.
    4. Trauma.
    5. Rigidity.
    6. Temperature variation.

Local Symptoms.

Tenderness is one of the first indications of pathology or irregularity, best determined by the sense of touch, but does not always indicate the degree of affection.

Tumefactions are not always perceptible to the eye, especially when the deep structures are involved, but when they are within the cutaneous structures they can usually be observed. Palpation will reveal growth of ordinary size situated within the deeper structures and they may be recognized visually, this depending upon their size.

Color. The cutaneous structures may ofttimes be discolored and its character may aid materially in determining conditions.

Trauma of the perineal body is quite common and it may be inflicted from within or without, or the two sources combined. It is only the more superficial wounds, the characters of which may always be determined by visual inspection alone.

Rigidity may occur in any muscular tissue, especially that for sphincteric purposes, such as is found about the rectum, vagina, urethra vesicle openings of the ureters, cervix uteri and Fallopian tubes. In fact nearly all of the muscular fibers found in the perineal tissues and their associated organs are of this character, for the purpose of relaxation and contraction that matter may be received and expelled through them.

The function of contraction is probably more important in man, because of his erect posture, especially at the conclusion of the act of urination and defecation, both of which necessitate a more complete closure of the opening.

Temperature may be local and very several degrees below to the maximum above normal. When the general temperature is high, the local temperature may be normal or subnormal. This variation is more easily determined when the lesion is situated in the hands and lower extremities, especially the feet.

General Physiologic Symptoms.

1. Pain.
2. Chill.
3. Temperature.
4. Lymphatic.
5. Cardiac.
6. Gastric.
7. Perspiration.
8. Respiration.
9. Alimentary.
10. Nervous.
11. Cephalalgia.
12. Delirium.
13. Convulsions.
14. Coma.
15. Shock.

Pain and irregular growth probably rival in importance all other symptoms, the first being subjective and the second objective, one described by the patient, the other observed by the attendant.

Pain thus being of such importance must necessarily be attributed to involvement of the nerves, where many branches of the pudic nerve are to be found.

The severity of pain does not always increase or diminish the pulse rate, even with the most severe lesions, but when the rate is rapid and feeble, serious conditions may be suspected. This may also be said of the pulse when it is slow, full and bounding in character.

Pain of any degree may always be considered a symptom, though nervous tissue be not pathologic. The causes of painful disturbances are indeed numerous, therefore difficult to classify. Pain may be of local origin or reflected, for example when pain is present in the distal end of the penis, due to the presence of a vesical calculus.

Chill usually occurs soon after infection but may be the result of shock and vary in degree from mild to severe, and of but a few minutes' duration, though it may continue for several hours without bacterial infection.

Temperature may vary from 95 to 106 degrees F., due to many causes, local or general, continued or remittent, regular or irregular in course, and of short or long duration. It would seem at times to exist without infection when it rises suddenly to 105 degrees or more, following the introduction of a urethral sound, for it will then disappear as suddenly as it appeared.

It may be confined to certain localities, among them, the perineum and its immediate, related organs and tissues or when general, affect the entire body.

Lymphatics. There may not be any evidence of lymphatic disturbances though they probably exist, because it is difficult to understand how pathology of any character can exist in the perineal region without affecting their normal status.

Cardiac disturbances are always manifested in the arterio-vascular system, and they may vary from mild to severe, regular or irregular, slow or rapid, or the radial pulse may be absent with the presence of severe shock.

Gastric. There may be severe or mild stomach disturbances such as nausea, acidity, vomiting or eructation of gas.

Perspiration is due to varying degrees of heat produced from without or within the body. When within, infection and cardiac stimulation are the exciting causes, while the external cause is excessive heat or exercise. It may be due to nervous irritation of any character.

Respiration is usually increased with the presence of infection, but it may be increased or diminished without, as when nervous irritability or severe pain is present. Increased respiratory movements are usually manifested when infection is severe and proportionate with its degree.

Such disturbances are not manifested to any considerable degree, except when the lesions or infection have become well advanced, then rapid, irregular, deep or shallow breathing sometimes accompanied by sighing is in evidence.

These respiratory changes may occur as the result of neurosis independently or the two factors combined.

Such disturbances are more frequent with aggravated conditions of the bladder, ureters and kidneys and because of their relation and close proximity to the diaphragm and other important structures and organs, especially the intimate association of the renal sensory nerve fibers with those of the diaphragm.

Alimentary disturbances such as nausea and vomiting are not unusual and they may be mild or severe, without indicating serious conditions, but they may when severe and continuous, indicate the severity of their cause.

They may exist to a mild or severe degree without infection, or rise of temperature and be purely of nervous origin.

The more severe types are usually confined to involvement of the bladder, ureters and kidneys, though they may exist when the urethra alone is their origin.

Nervous disturbances are of many varieties and degrees, as the result of affections within the perineum and its associated organs. They may be in the form of local or general irritability with restlessness and their various associated phases.

Cephalalgia may exist with more or less severity and be localized or general, periodic or constant, sharp or dull, in character, occur without infection, or the rise of temperature, result from physiologic disturbances alone, or any other of the recognized causes.

Delirium not infrequently results from the more aggravated conditions herein described, and its degree may not correspond with that of infection or involvement of the perineal structures and organs. It may be mild or severe but usually is of short duration and usually accompanies a high degree of temperature due to infection.

Convulsions resulting from disease especially of the kidneys and uterus, or their appendages, are not uncommon, occasionally due to diseases of other parts of the uro-genital or rectal tracts, or the perineal body, and without increased temperature in either instance. They may be severe or mild, of short or long duration and of short or long intervals.

Coma may follow immediately or soon after convulsions, or it may exist without or the previous occurrence of convulsions, and vary from slight to profound in degree, with distinct or muttering syllables, in the milder form, and of short or long duration. Like convulsions it follows the more severe types of disease and during their last stages.

Shock may be mild or severe, of short or long duration, and usually due to some form of trauma, though it may be the result of disease. The more severe forms are associated with loss of consciousness, but such is not the case with that milder in character.

Because only physiologic symptoms are to be herein considered, it will be necessary to deal only with functional disturbances, such as pertain to the following systems:

1. Cardio-vascular.
2. Nervous.
3. Lymphatic.
4. Urinary.
5. Reproductive.
6. Rectal.

Conditions which cause symptoms, are mentioned in each chapter and each chapter intended to describe symptoms and their relation to symptoms, caused by conditions mentioned in other chapters, that composite symptoms may when possible be definitely determined.

The study of uro-genital and rectal diseases should not be divorced and because of their very intimate relation, their consideration should represent but one specialty.

DIAGNOSIS.

GOULD'S DEFINITIONS.

"*Diagnosis* is the distinguishing, fixation or interpretation of a disease from its symptoms."

"*Differential diagnosis* is the qualitative distinguishing between two diseases of similar character by comparative symptoms."

"*Direct diagnosis* is the recognition of a disease from the existence of one or more signs or symptoms, independently or in relation with other symptoms, or with age, sex, physical or mental characteristics, residence or occupation or with the family history."

"*Physical diagnosis* is the application of physical methods to the study of disease."

"*Exclusion diagnosis* is the recognition of disease by excluding all other known conditions."

Certain diagnoses may be made exclusive of subjective symptoms, by certain observations without the use of mechanical devices; they may often be ascertained by what is observed directly with or without such means, but there are many diagnoses that cannot be made without the two methods combined and still others that can never be made, with all known methods combined, including those objective, without mechanical devices. (B. M. R.)

Mechanical devices for diagnosis have become so perfected that they are now indispensable, for examination of regions unavailable to the eye or sense of touch.

Much therefore depends upon their proper use in making diagnoses certain. A great many times symptoms alone will be of no avail, but now that symptoms have been more properly classified and understood, they will serve a better purpose when mechanical devices are resorted to for diagnostic purposes.

One or more *mechanical* devices alone will frequently determine conditions, but their employment in conjunction with subjective or objective symptoms will be more frequently necessary.

Digital. The sense of touch and sight of the examiner are the first of the various methods to be applied in determining conditions. The first to test sensibility, tension, size, location and shape, which when aided by the second will be more definite.

Sounds may be employed in detecting the course and size of channels, their obstruction and contents, whether they be in soft or hard structures, or connected with normal or abnormal cavities.

Sense of Sight.

1. Eye, alone.
2. Mechanical.
    1. Specula.
    2. Trocar.
    3. Thermometer.
4. X-Ray.
5. Microscope.
6. Chemical.
7. Surgical exploration.

Eye alone may be all sufficient to determine certain conditions diagnostically.

Specula with or without reflected light are indispensable many times in canals and cavities, because they bring to view that which could not otherwise be seen.

The trocar permits of fluid being removed from tissues and cavities for diagnostic and curative purposes.

Thermometer. While temperature may be determined by the sense of touch and general condition of the body, its degree variance in degree and location cannot be otherwise determined. It is therefore a most important adjunct in diagonstic measures.

Radiography permits of shadow study in the discovery of the presence of anomalies, disease, foreign bodies, concretions, and injuries, and has been the most resourceful of the newer methods in vogue.

The *Microscope* for bacteriological findings should be employed with the earlier examination and will often decide the diagnosis, without further difficulty, but its use to determine the character of pathology usually comes after the completion of surgical work.

Chemical analysis constitutes the determination of the constituents of normal and abnormal fluids and solids in the body, whether they be chemical, microscopical or bacteriological.

Surgical exploration should be made at the earliest possible period in the course of conditions which necessitate a diagnosis, or it should be delayed until all other methods have been resorted to and then completed if necessary, at the conclusion of the exploration. It will, as a rule, be more definite than all others, while in some, all methods combined will be needed and a few will then remain undetermined.

CHAPTER IV.

BLOOD VESSELS.

ANATOMY.

ANATOMY OF ARTERIES. As the large and small arteries are very similar, a description of the medium-sized will suffice. An artery consists of three main coats: 1. The intima (or inner layer); 2, the media or thick muscular layer; 3, the adventitia or outer elastic coat containing the nervi vasorum, vasa vasorum and the lymph channels of the vascular wall.

Anatomy of the Veins. The walls of the veins are always thinner than the corresponding arteries. They are very similar in structure, containing the three coats somewhat less distinctly differentiated. They are more flaccid and less contractile in consequence of the smaller amount of elastic and muscular tissue they contain.

The rich supply of blood to the perineum is important because of the presence of so great a variety of organs and tissues and must therefore play an important rôle in symptomatology.

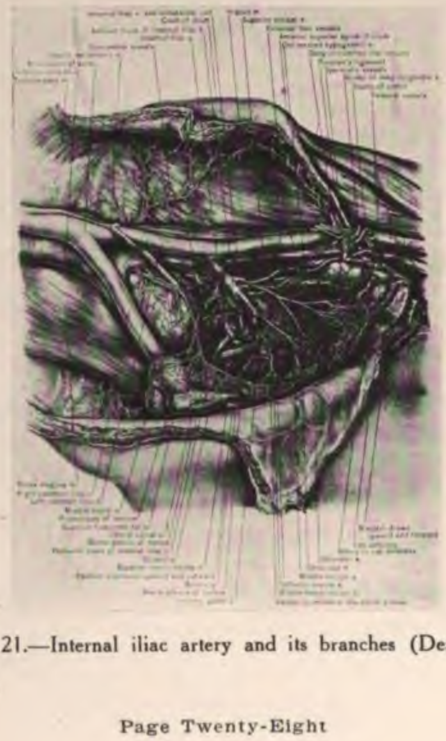

Fig. 21.—Internal iliac artery and its branches (Deaver).

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, vary in length, circumference, size of lumen, relation to other structures, or vessels entirely absent.

DISEASES.

Benign. Malignant.

BENIGN.

Atheromata may be congenital or acquired, primary or secondary, single or multiple, varying in location, number, extent, partial or complete.

Varicosities may be congenital or acquired, primary or secondary, single or multiple, involve several vessels, remain stationary, continue to grow, or disappear spontaneously.

Aneurisms may be congenital or acquired, primary or secondary, single or multiple, in any vessel or locality, vary in size, remain quiescent, continue to grow, or disappear spontaneously.

Tuberculosis may be primary or secondary, single or multiple, acute or chronic, vary in extent, location, remain quiescent, continue to develop or disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, acute or chronic, involve one or more vessels, disappear, or continue in its destruction.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and location.

Occlusions may be congenital or acquired, primary or secondary, single or multiple, partial or complete, vary in location and number of vessels.

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, at any point, in any vessel or tissue.

Sarcomata may be primary or secondary, single or multiple, at any point, in any vessel or tissue.

INJURIES.

Incisions, ruptures, punctures, contusions are the result of accident or design, primary or secondary, single or multiple, longitudinal or circumscribed, vary in extent and location, through the perineal body, rectal or vaginal wall, urethral canal, bladder, or peritoneal cavity.

Veins. Trauma and infection, especially in the female, are prolific in their symptom complex. Phlebitis of the broad ligament veins, left iliac tributaries, is the most common of complications.

The *Pampiniform* plexus phlebitis causes many obscure neuroses and possibly neurasthenias, which develop repeated exacerbations with the slight uterine infections from monthly changes. *Dysmenorrhoea* is usually associated with slight infections but enough to cause frequent phlebitic involvement that subsides usually after a free flow of blood from the uterus.

Hemorrhoidal vessels are frequently infected, a condition that may be very serious, especially when thrombotic.

Post-operative infections of the hemorrhoidal veins which are involved, intestinal ulceration causing mesenteric thrombo-phlebitis with gangrene of the intestines and appendicitis infections, travel into portal veins causing a portal thrombo-phlebitis.

The uterine sinuses in aborting and parturient women with the associated clotting, may be a prolific source of infection not only of the pelvic veins, but also of the general peritoneal cavity, as is manifested by the frequency of Coli cystitis in parturient women. Infected clots and decidual membrane in the puerperal state always cause some infection. A perfect aseptic lochial discharge is rare because change of attendants is usually marked by a temperature rise showing how very sensitive the parturient woman is to infection. This is due entirely to careless handling and lack of asepsis.

SYMPTOMS.

Symptoms pertaining to *blood vessels* in the perineum, genito-urinary and rectal tracts, are more or less characteristic, especially when the vessels have been opened by disease or injury, in which instance their contents would escape into the various soft structures, thereby producing the same symptoms that are found with disease of the lymphatic structures, except that pain, induration and tenderness would appear more suddenly, therefore more definitely determined.

Anomalies and disease of vessels offer greater difficulty in ascribing symptoms, and like atheromatous degeneration which is usually due to senility, may occur in middle life with all of the consequences, due to other causes. Arteriosclerosis may be local or general, but when local, its effects upon the genito-urinary and rectal tracts are manifested by certain symptoms, such as loss of function, atrophy and sensation, each due to loss of blood supply. The same condition may be the result of congenital vessel defect, but vessel trunks or many of their branches must be deficient to cause such a condition, because of the rich collateral blood supply within these structures.

CHAPTER V.

NERVES.

ANATOMY.

THE ANATOMY of the Nerve Trunk. The fibers composing the peripheral nervous system are grouped into the larger and smaller nerve trunks, which extend to various parts of the body.

In the make-up of those that supply both muscles of sensory surfaces (integument or mucous membranes) three sets of fibers are included: 1. The efferent axones of motor neurones, whose cell bodies are situated in the spinal cord or brain; 2, the afferent dentrites of sensory neurones within the spinal and other sensory ganglia; and 3, the efferent axones of neurones within the sympathetic ganglia that accompany the spinal fibres to the periphery and serve for the innervation of the involuntary muscles of the blood vessels, and of the skin and glands.

These fibers are grouped into bundles (funiculi). Each funiculus is surrounded by a definite sheath of connective tissue, the perineum, which is directly continuous with the delicate fibro-elastic tissue prolonged between the individual nerve fibers as the *endo neurium.* (The perineurium may contain lymph spaces.) When, as is usually the case, the nerve is composed of several funiculi; these are loosely bound together and the entire

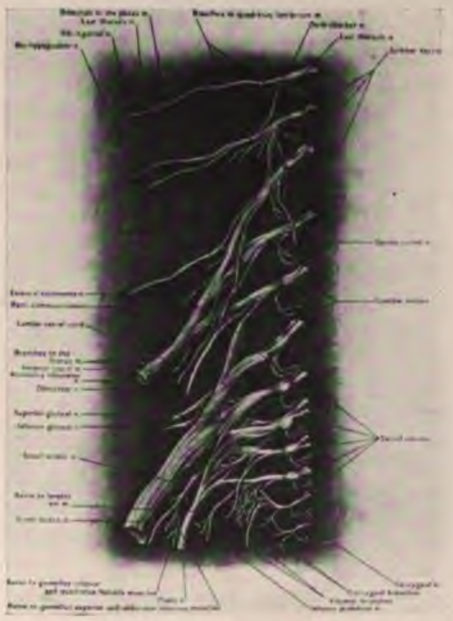

Fig. 22.—Diagram of the lumbar and sacral plexuses (Deaver).

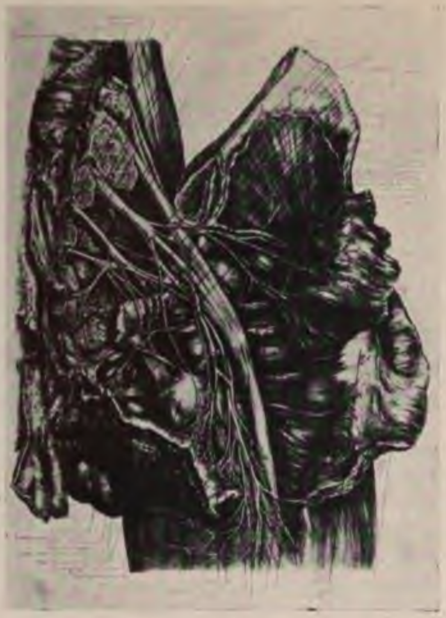

Fig. 23.—Diagram of sacral perineum (Deaver).

trunk so formed is invested by a general envelope, the *epineurium*, in which course the blood-vessels and lymphatics. The envelopes of the nerve trunks are continued over its branches even into its smallest subdivisions. The last representative being seen on the individual fibre as the sheath of *Henle*.

The perineral and sympathetic nerves, the epithelium of the anus and the immediately adjacent parts of the rectum and the epithelium of the vagina and urethra are formed from the *ectoderm*, while the urinary and generative organs except the epithelium of the urinary bladder and urethra are from the *mesoderm*. The whole of the vascular and lymphatic systems and connective tissues are also from the mesoderm.

From the *endoderm* are to be found the rectum and epithelium of the urinary bladder.

The *pudic* nerve which supplies the perineum, the uro-genital and rectal tracts is both motor and sensory, and derived from the second, third and fourth sacral nerves. It was split into many branches when the perineum was formed, which was the beginning of the mammalian period.

One branch was for the purpose of supplying the uro-genital, the other the rectal tract and while the nerve has been divided into two branches, their functions are identically the same and their impulses more or less the same, because the central nervous system receives impulses from the two alike. Irritation of one, often produces irritation of the other. Sometimes that of one dominates that of the other profoundly. This is often demonstrated when irritation of the sphincter ani produces greater sexual excitement than irritation of the sexual organs themselves, and *vice versa*.

The pudic nerve and its branches, sometimes vary slightly in their course, but it usually passes forward in the outer wall of the ischio-rectal fossa, divides into the perineal and dorsalis penis nerve and accompanies the pudic artery. Deaver states that nerve terminals like blood vessels and lymphatics, are found in each muscle fibre, that each tissue of the body may be brought under the control of the central nervous system, motor and sensory fibers being alike influenced.

Topographically the relation of the pudic nerve, its branches, lymphatic channels, glands and blood vessels, have been materially changed to meet the requirements incident to the passing from the cloacal to the mammalian type of the lower pelvis. Nerves travel under the endothelia, chiefly in bundles, sometimes in net work and all nerves, blood vessels and lymphatics anastomose that they may be more perfect in function.

Among the many branches of the pudic nerve for consideration are the

1. Sacro-coccygeal.
2. Sacral (posterior division).
3. Coccygeal (posterior).
4. Perineal.
5. Penis-clitoris.
6. Urethral.
7. Prostatic.
8. Rectal.
9. Testicular.
10. Scrotal.
11. Spermatic ducts.
12. Uterine.
13. Vaginal.
14. Fallopian.
15. Ovarian, each of which is described with the tissues which they inhibit, namely:

1. Integument.
2. Fascia.
3. Muscles.
4. Organs.
5. Blood vessels.
6. Lymphatics.
7. Glomus Coccygea.
8. Coccyx.
9. Cowper's glands.
10. Bartholin glands.
11. Rectum.

The multiplicity of nerve trunks and fibers supplying the perineal structures and immediate associated organs and structures, must necessarily be the cause of a great variety of symptoms.

Nerve centers and nerve fibers are distributed in the walls of all blood and lymph vessels, especially in their deeper layers and are wound around them by the finer nerves. The adventitia and muscularis contain two layers of these small fibers which penetrate the intima.

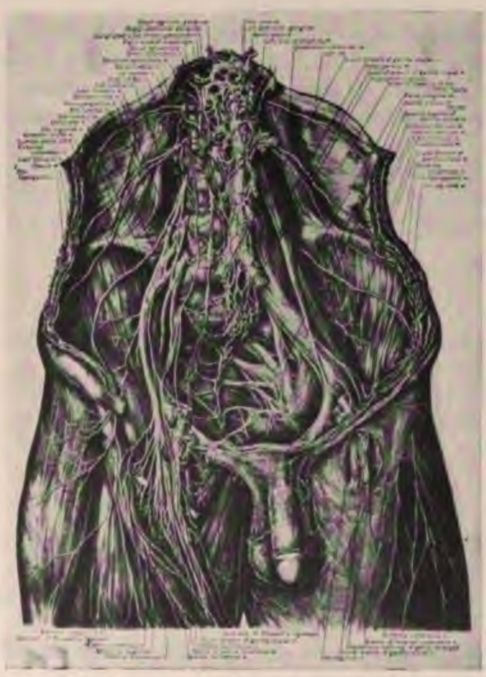

Fig. 24.—The lumbar plexus (Deaver).

Ganglion cells are found in the superficial layers of the arteries of organs, but not in their deeper layers.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, length, course and location, or be entirely absent.

DISEASES.

Benign. Malignant.

BENIGN.

Neuromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, extent, location, remain quiescent, or continue to grow, but probably never disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, vary in size, shape, location and degree, in one or more nerves or sheaths.

Tuberculosis may be primary or secondary, acute or chronic, single or multiple, vary in location and degree, in any nerve or sheath.

Cysts may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, in the sheath or body of one or more nerves, contain blood, pus or serum (usually serum), vary in size, location, rate of growth, remain stationary, continue to grow, or disappear spontaneously, without loss of function when the sheath alone is involved.

Fistulae may be congenital or acquired, single or multiple, primary or secondary, remain open, close permanently, appear periodically, open upon the cutaneous structures, into the rectum, vagina, urethra, bladder, uterus or peritoneal cavity.

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, in any nerve or sheath (usually the sheath).

Sarcomata may be primary or secondary, single or multiple, in any nerve or sheath, vary in size, location, rather of growth and usually in the sheath.

INJURIES.

Lacerations, incisions, punctures, may be the result of accident or design, primary or secondary, single or multiple, vary in extent, location, irregular in form, partial or complete, sharply defined, through the perineal body into the urethra, rectum, vagina, bladder or peritoneal cavity.

Nerves are subject to injury and disease such as inflammation, acute and chronic, simple and infectious, therefore must necessarily play one of the most important rôles in the category of symptoms such as are connected with the perineal body and its intimately associated tissues and organs. The resistance of the nerves in this region to disease, would seem greater because of the uro-genital and rectal tracts possessing a greater variety and number of bacteria.

This rule should obtain alike with blood vessels and lymphatics which are also the distributors to muscle, fat, fascia, tendons, ligaments, periosteum, bone, cutaneous structures and organs.

Nerve sheaths probably have less resistance, but whether they can be inflamed to any degree without more or less irritation to the nerves is uncertain.

Nerves like *lymphatics* and blood vessels undergo degenerative changes due to senility, injury and disease. Then why should such changes not be earlier in the perineal region which is inhabited by so many infectious bacteria?

Is it not possible to have such changes appear locally and earlier in this region because of their presence?

If so, the manifestations would be atrophy, resulting in pain, discomfort, loss of function or formation of concretions and new growth, such as are found to exist with incontinence, calculi and prostatic hypertrophy.

SYMPTOMS.

Local. Tenderness is elicited by the sense of touch which may cause pain varying in degree when a nerve is injured or pathologic. A nerve may be sensitive with or without pressure at the point of lesion and though a nerve throughout its course may be sensitive and painful when its distal fibers are primarily involved, the pain and sensitiveness may be limited to such an area or general nervous irritability may exist with severe pain, constant or periodic in character throughout the pelvis and thighs, especially the genito-urinary and rectal tracts.

Severe pain may be associated with, or followed by chill, headache, shock and perspiration.

CHAPTER VI.

LYMPHATICS.

ANATOMY.

ANATOMY of Lymph-Vessels. The structure of the lymphatics is very similar to that of the veins, the largest ones having the three coats, intima, media, and adventitia. The lymphatics arising from any network come together to form larger vessels, just as do veins, but they are more uniform in caliber, while a lymph vessel may be the same size as a vein at its origin, it will be much smaller than the vein at its termination.

Lymphatics are numerous and generally distributed throughout the perineal structures and organs, and their function probably more important during the period of gestation.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, vary in size, length, location and number of glands and channels or entirely absent.

DISEASES.

Benign. Malignant.

BENIGN.

Lymphomata may be congenital or acquired, primary or secondary, single or multiple, in superficial or deep structures, vary in size, shape, disappear, remain quiescent or continue to enlarge.

Tuberculosis may be primary or secondary, acute or chronic, single or multiple, vary in size, extent and location, remain quiescent, continue to grow, or disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size, extent and location, remain quiescent, continue to grow, or disappear spontaneously.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size, shape and location, contain blood, pus or serum, rupture externally, through the perineal tissues, internally into the rectum, vagina, urethra, bladder, uterus, or peritoneal cavity.

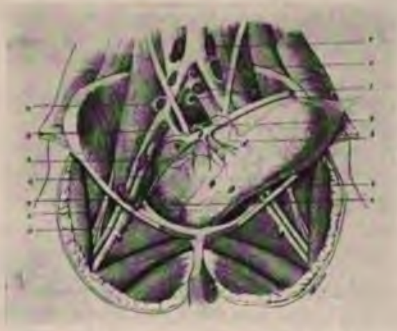

Fig. 25.—Lymphatics of the bladder in the new-born infant (Cunéo-Marcille).

a. External iliac gland (external chain). *b.* External iliac gland (middle chain). *c.* External iliac gland (internal chain). *d.* Deep inguinal glands. *e.* Left juxta-aortic gland. *f.* Gland of the promontory. *g.* Lateral vesical glands. *h.* Prævesical glands.

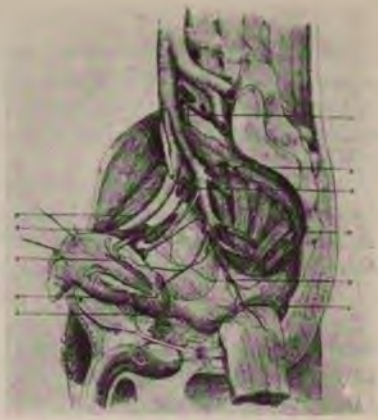

Fig. 27.—Lymphatics of the prostate (Cunéo and Marcille).

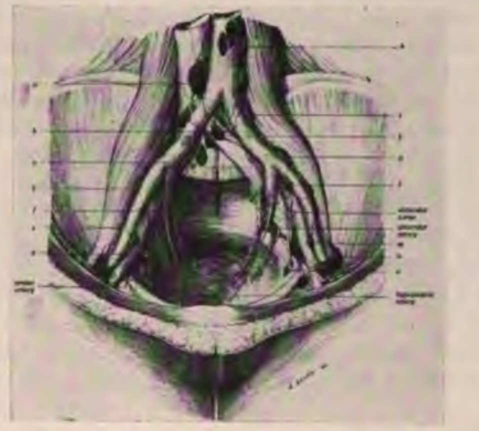

Fig. 26.—Iliopelvic glands (Cunéo and Marcille).

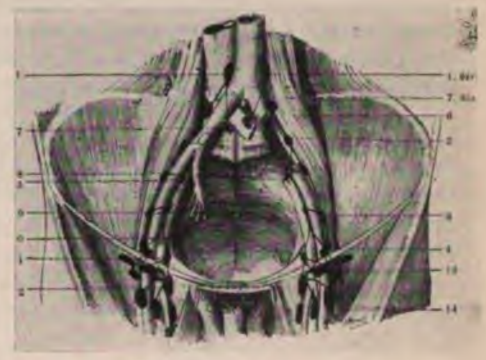

Fig. 28.—Scheme of the ileo-pelvic glands (Cunéo and Marcille).

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, in any of the lymphatic structures within the perineal body.

Sarcomata may be primary or secondary, single or multiple (usually single), in any of the lymphatic structures of the perineal body.

INJURIES.

Incisions, Lacerations, Contusions, are acquired by accident or design, primary or secondary, single or multiple, through the perineal body, rectum, or vagina, and vary in degree.

SYMPTOMS.

Lymphatic ducts and channels supplying the perineum subject to anomalies, diseases and injuries, offer symptoms which are manifested by enlargement, tenderness, redness, pain, chill, temperature, nausea, headache and vomiting, and the presence of serum, blood or pus, depending upon the degree of infection which may be acute or chronic, primary or secondary.

Pain is not always localized because it may be reflected to adjacent healthy tissues and may also be influenced by the degree of infection.

Induration is a determining factor in the symptomatology of all structures even to the slightest degree, but its importance increases with degree especially in lymphatic structures.

Rarely are the lymphatics of the inguinal or pelvic regions unpalpable. This enlargement of the lymph nodes is associated with tenderness and pain which necessarily causes nervous exhaustion and a symptom complex that space to describe would fill volumes. Again referred pain or reflexes to the knee, heel and back are marked. The necessary combined intoxication with a slight febrile rise has frequently associated headaches, general malaise, loss of appetite, and a general weakness, all of which causes invalidism. Ulcers of the rectal wall may cause a marked lymphangitis and enlarged lymph nodes.

Vascular influences upon the lymphatics are so slight in the beginning that they cannot be recognized, but as the pulse rate increases and becomes uniformily rapid and feeble, irregular or intermittent, from any cause, the lymph ducts and glands may justly be considered inactive.

If the temperature is high, lymphatic involvement is at once considered, though this does not always obtain.

Tenderness is one of the first manifestations of glandular affections, and the degree of pain increases with the amount of involvement until it becomes a distinct characteristic.

It may be local or general, acute or chronic, without local or general disturbances, color, infection, or induration, but these are exceptions. Lymphatic glands being without many sensory nerve fibers must necessarily be without much sensation, and for this reason direct pressure upon the glands does not elicit much pain; it is the surrounding structure, when involved, the nerve supply of which is greater, where pain is produced.

Normal glands are not sensitive to touch, but when infected, chill followed by headache and febrile, disturbances may vary in degree and the temperature may be local or general. Headache may, however, result from the slightest degree of infection, without other symptoms even to the degree of severe cephalalgia, but this seldom occurs without the more severe forms of infection. When they occur, nausea and vomiting and even shock may be present and vary in degree.

CHAPTER VII.

GLOMUS COCCYGEA.

ANATOMY.

HISTORY.—A small reddish-yellow body situated about the tip of the coccyx was first discovered by Luschka, 1859, since which time it has been known as Luschka's gland though it has long since been discovered not to be a gland because it does not possess glandular tissue.

Walker, 1904, suggested that this small body might be a gland of internal secretion but it can not perform such a function if it does not possess glandular tissue.

Much has been written pertaining to the anatomy, function and pathology of this most interesting mass of cells without revealing anything definite concerning its physiology. Until such a discovery, continued interest will be manifested with this in view.

It is a vascular plexus, a *rete mirabele* and not a gland. The human coccygeal gland (so-called) or Glomus coccygea, is a reduction product due to the decrease in size of the caudal region. In man it usually is found as one ovoid body attached to the arteria sacralis media, lying on or near the ventral side of the distal end of the coccyx. Sometimes it is separated into several pieces or distinct glomeruli. It is descended from the glomeruli caudales of the lower mammals.

In the adult human it is an arterio-venous plexus of varying complexity and size. The plexus takes the form of a nodule inclosed in a fibrous sheath. The vessels composing it may be divided into the afferent artery, the efferent vein and the connecting anastomosing channels. Although sparsely innervated by the sympathetic it has no special relation thereto. Besides the sheath and the vascular channels, the principal histological element which forms a considerable part of its mass, are the endotheloid cells, which are numerous and appear to be derived from the transformed muscle cells of the arterial walls and which remain intimately associated with the walls of the vascular channels. Other than these, there are no structural elements entering into the make-up of this organ.

Non-striated muscle cells are distributed throughout the stroma.

It is not known what function the glomus serves in the human physiology.

Phylogenetically the human Glomus coccygea is the descendant of the numerous Glomeruli caudales of the lower mammals, which, due to the shortening of the tail, have become condensed into the usually single and much larger Glomus coccygea of man.

The sympathetic nerve trunk accompanying the A. sacralis media is often enmeshed in the substance of the glomus, but this is purely a mechanical relation as the innervation of the tissues of the glomus is not in such cases increased. However, single and clusters of "nerve end" bodies somewhat resembling Paccinian bodies, are found in juxtaposition to the glomus.

The glomus occurs as one or many nodules lying near the anterior aspect of the tip of the coccyx. If often appears pedunculate owing to the elongation of the artery and vein connecting it with the median sacral vessels.

The glomus develops within a mass of embryonic cells, by the branching of the median artery and vein, and first appears caudad of the actual tip of the last coccygeal segment.

In the dog the Glomeruli Caudales exist as a chain of knots extending from the 8th or the 9th caudal vertebra, caudad, to the tip of the tail increasing in size backward, the largest glomus occurring at the tip of the tail. The anatomical and histological structure is similar to that of man.

In the Macacus monkey as many as ten glomeruli occur in one animal. They are all closely attached to the A. sacralis (caudalis) media and increase in size from the anterior caudal vertebrae caudad to the tip of the tail. They usually occur one in each segment. They constitute a series of segmental plexuses inserted between the artery and the vein and afford a direct connection between the two without the mediation of capillaries. The largest of them is only a few millimeters in length.

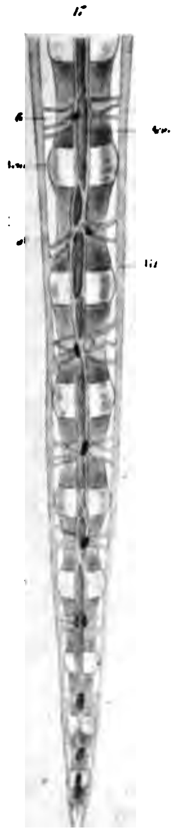

Fig. 29.—Tail of Macacus Monkey, showing a Glomus at each bony segment (Schumacher).

Glomerulus coccygeus.

Glomeruli caudales.

Among mammals the glomeruli occur in that section of the tail where the vertebrae lose their ventral arches but still retain the haemal arches.

Glomeruli have been found in		*Beginning at the*
Macacus cynomolgus—common Macacus.		
Macacus rhesus		
Felis catus	cat	8th caudal vertebra
Canis vulpes	fox	
Canis familiaris	dog	8th to 9th caudal vertebra
Lutra vulgaris	otter	12th caudal vertebra
Scuirus vulgaris	squirrel	10th caudal vertebra
Lepus canniculus	rabbit	
Mus rattus	rat, mouse	14th caudal vertebra
Sus scropa	pig	
Bos taurus	ox	
Equus caballus	horse	
Cynocephalus hamadryas Pavin.		

DESCRIPTION OF FIGURES.

S. V. Schumacher-Glomus Coccygea and Glomeri Caudales.

1. Section of Gl. coccygeum of executed criminal. A., anastomosing vessels with epitheloid wall. M., muscle bundle entering Glomus. S., con. tissue stroma. V., outgoing vein. X70.
2. Closed anast. vessel of Gl. c. of 3-year-old child. E., endothel EZ. epitheloid cells. S., stroma. X460.
3. Anast. vessels of Gl. c. executed g P. perimysium internum inclosing Epitheloid cells. E. S. stroma. X460.
4. Transition of artery with anast. vessel in Gl. c. new born babe. M., nonstriated muscles and transition stages into epitheloid cells eZ. E., endothil X460.
5. Transition of anast. vessels into vein of Gl. c. 22-year-old man, shows that epitheloid cells disappear as vein is approached X460.
6. Same as 5 from 5-year-old child X460.
7. Same as 5 and 6 from executed woman X460.
8. Three nerve end bodies lying near Gl. c. lumen foetus 34 cm. long. X460.
9. Same as 8 from new born. L., lammellated bodies. K., capsule. G., location of Gl. c. X170.
10. Anlage of Gl. c. human emb. 52 cm. long. A., art. sacralis media showing thickening of media. M., cells of media becoming epitheloid. V., vein. E., endothel. X460.
11. Section Gl. caudale Cynocephalus hamadryas. A. C. branch of art. c.m. entering Gl. c.
12. Artery of Gl. c. of dog. Ac. wall of art caudalis media, showing muscular layers. X70.
13. Section of anastometic branch of vessel of Gl. c. of Cynocephalus hamadryas. E., endothel. I h. inner longit. muscle. Z. M., circular muscle. A l., outer long muscle. S., stroma. X460.
14. Section anastimotic vessel of dog. M., epitheloid muscle cells. E., endothel. S., stroma. X460.
15. Section anastomot. vessel Gl. c. executed woman. E., endothel. E z. Epitheloid cells. S., stroma. X460.
16. Two small Gl. c. 55-year-old woman, artery red, vein blue, anastomotic vessels violet. X57.
17. Vessels of tail of Macacus rhesus ventral vein. A c m., arteria caudalis media. V c m., Vena caudalis media. V c l. Vena caudalis media. A v., Anastomotic veins between V media and V lateralis. G., Glomeruli caudales.
18. Vessels from distal section tail of Macacus rhesus. G., large Glomerulus. K., Small one.

1. *J. H. Jakobsson. Glomus coccygea.* X40. Sagittal section embryo 1.8 cm. long.

ar. arterio sacralis media.
bl. glomus.
bp. vascular papila.
c. central canal.
ccg. glomus coccygea.
ch. chorda dorsalis.
d. gut.
ep. epidermis.
ft. filum terminale.
kaps. capsule of stroma.
m. non-striated muscle.
mv. medullary tube.
n. nerve.
par. cartilage parenchyma.
str. stroma.
su. caudal appendage.
sy. sympathetic anlage.
tb. terminal vesicle of nerve tube.

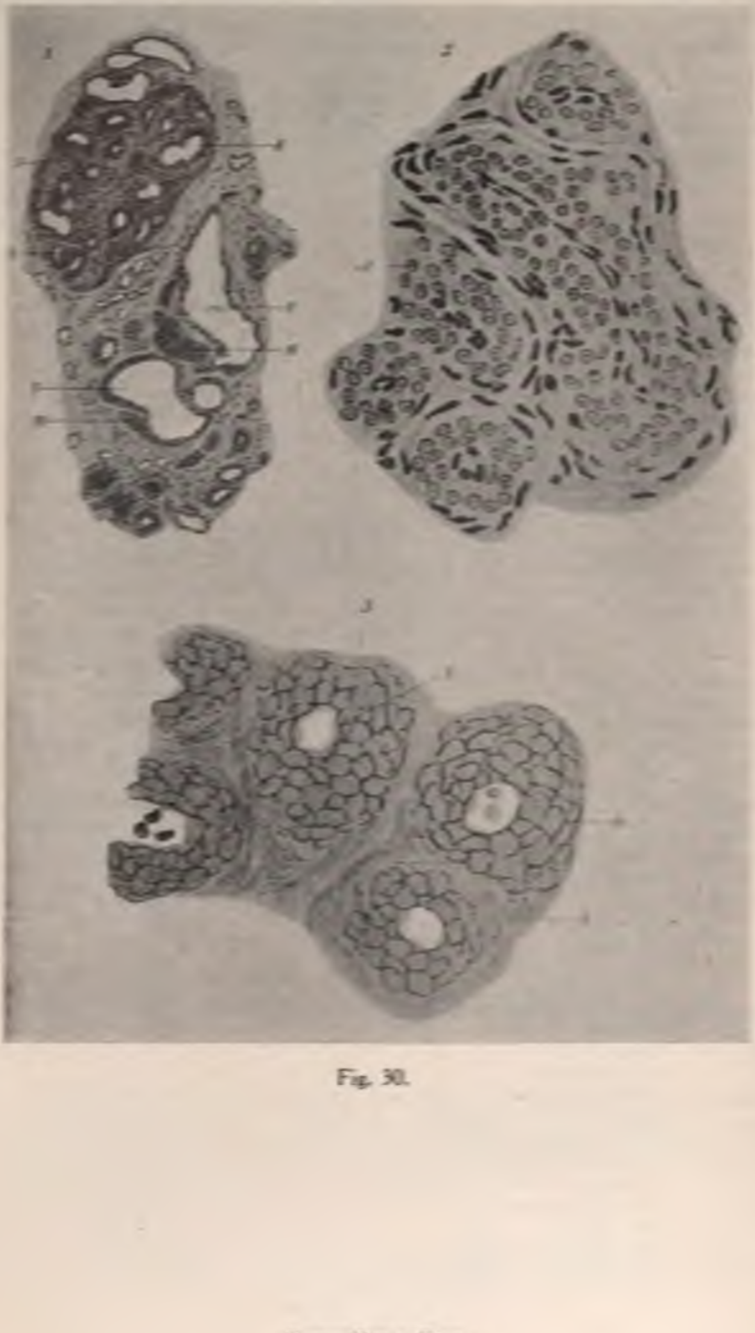

Fig. 30.

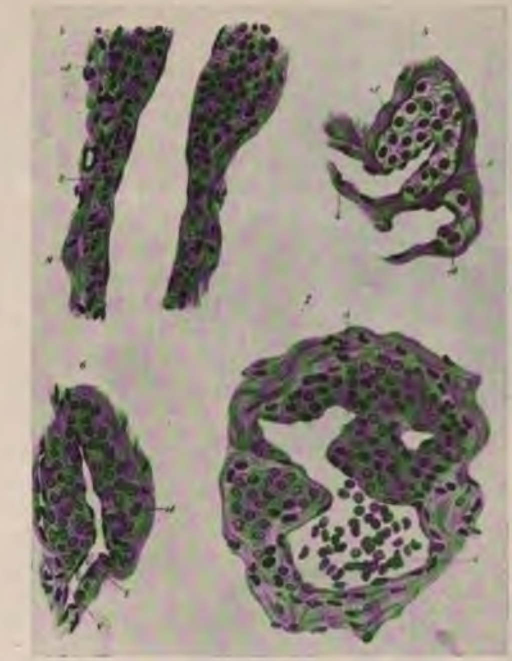

Fig. 31.

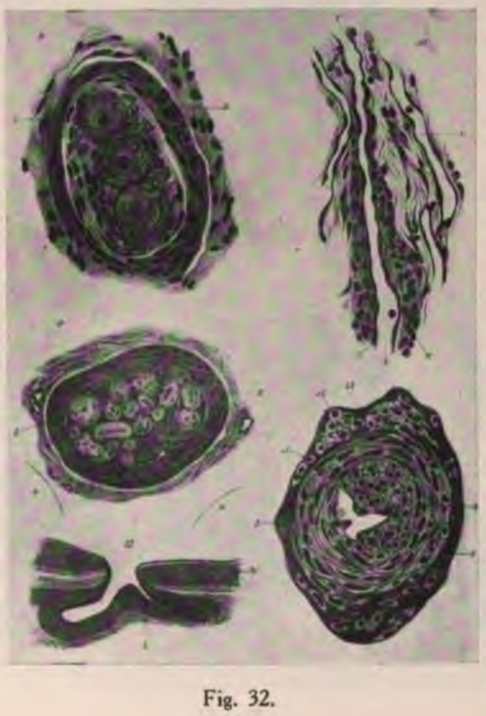

Fig. 32.

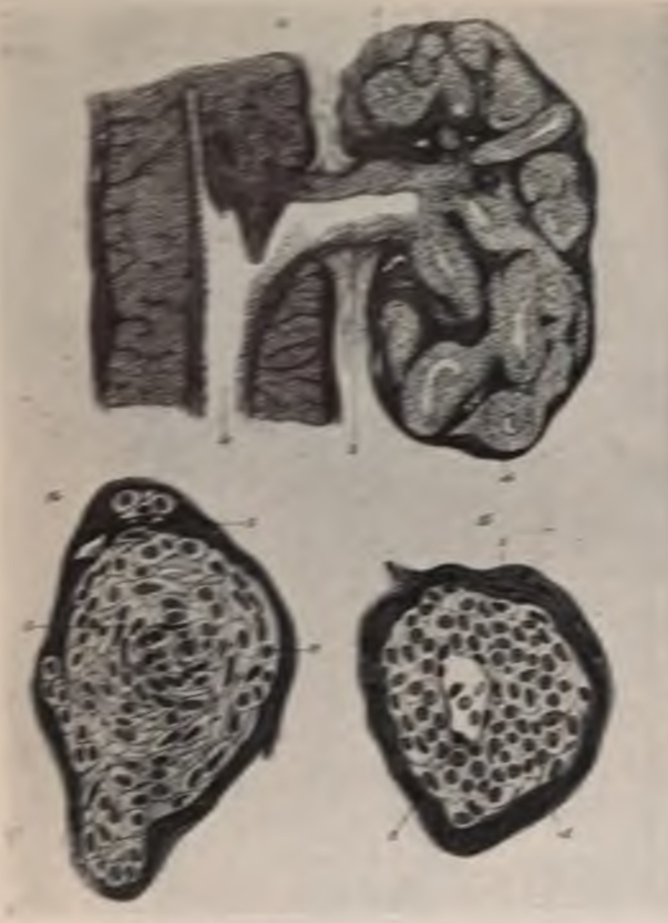

Fig. 33.

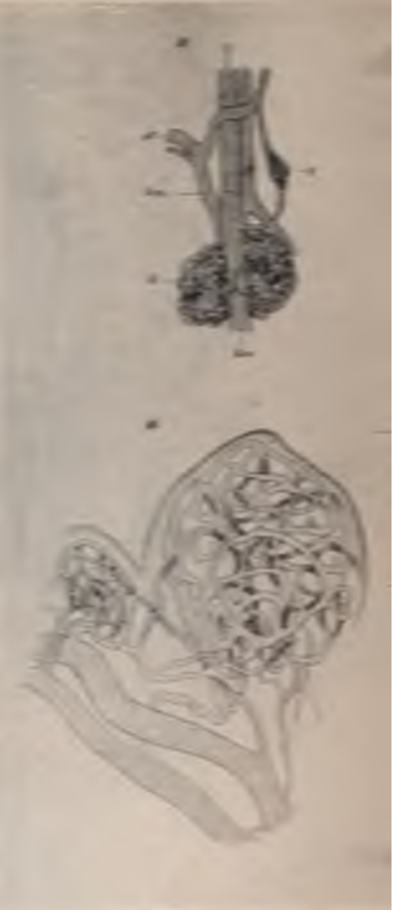

Fig. 34.

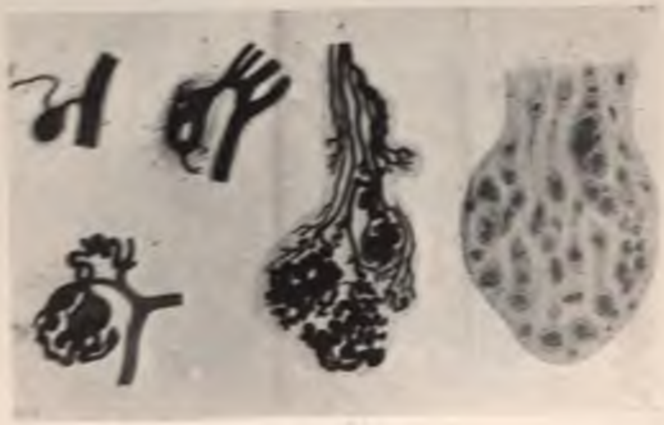

Fig. 35.

2. ×20. Sagittal section embryo 7.5 cm. long
3. ×15. Sagittal section embryo 1.5 cm. long
4. ×15. Sagittal section embryo 6 cm. long.
5. ×65. Transverse section embryo 8.1 cm. long.
6. ×90. Section of Glomus coccygea.
7. ×300. Sagittal section of Glomus and med. tube.
8. ×300. Transverse section of Glomus.
9. ×55. Transverse section of Glomus of adult.
10. ×350. Transverse section of Glomus of adult.

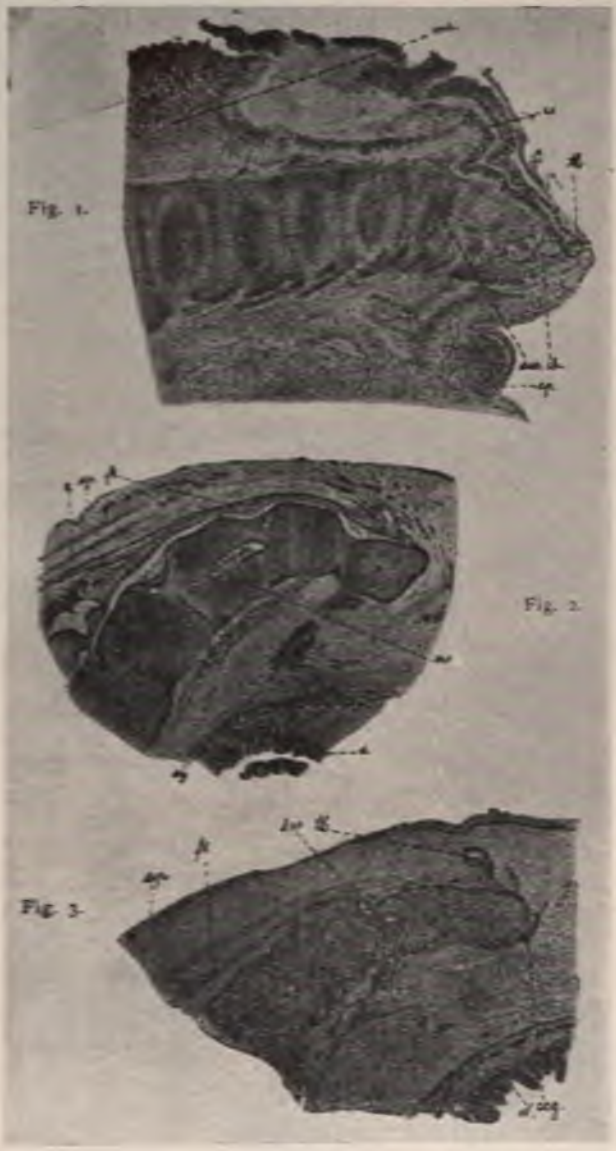

Fig. 36.

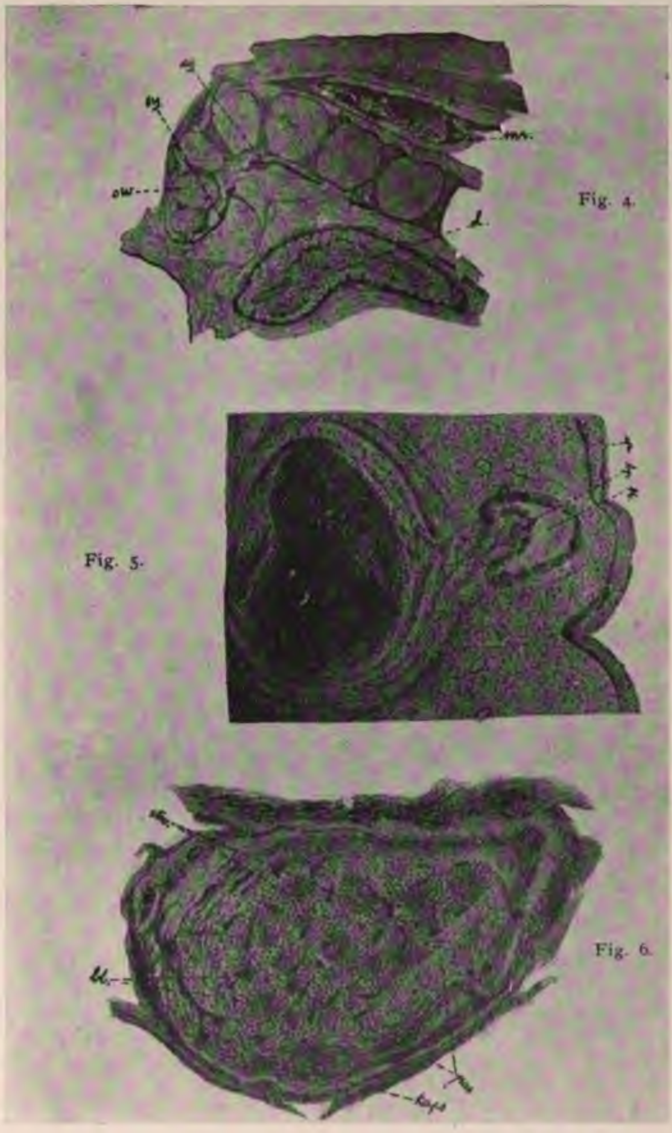

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 37.

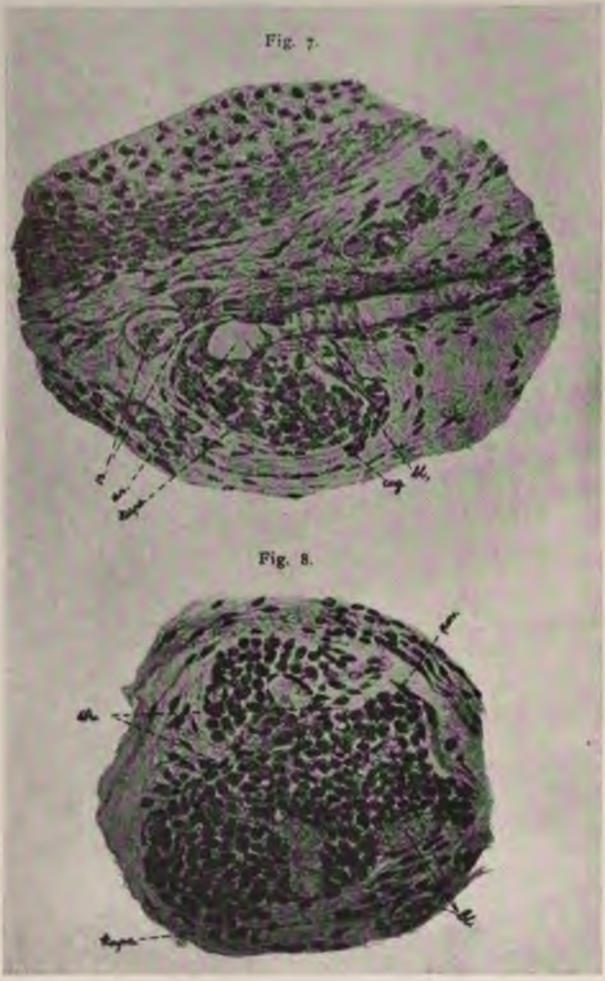

Fig. 38.

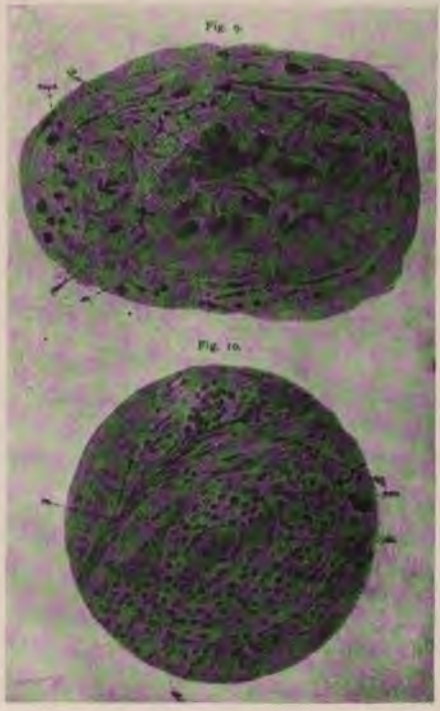

Fig. 39.

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Anomalies may be in number when several distinct bodies exist in the same person, when one is larger or smaller than usual, or when it is not situated immediately over and in front of the tip of the coccyx.

It may be entirely absent but this, however, is only a conjecture based upon the knowledge that other bodies are congenitally absent.

ETIOLOGY.

Etiology.—Investigation pertaining to the function, pathology and symptoms of the Glomus is so very meagre, that it is difficult to draw any very decided conclusions, but with the existence of its irregularities an attempt will be made to give it greater consideration in the rôle of symptomatology.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

DISEASES.

Benign. Malignant.

BENIGN.

Benign diseases may be of almost any variety and assume indefinite proportions. Those most common are simple hypertrophy, lymphoma, adenoma, fibroma, tuberculosis, syphilis, cysts and injury, either one of which except tuberculosis may be congenital or acquired.

Simple hypertrophy due to some form of infection may be congenital or acquired, primary or secondary, acute or chronic, vary in size and location, undergo cystic degeneration or remain a solid growth.

Lymphomata may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, varying in size, shape and location.

Adenomata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Fibromata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Tuberculosis may be primary or secondary, acute or chronic, vary in extent, involve other structures, subside, continue to destruction or disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, acute or chronic, remain quiescent, continue to grow, or disappear spontaneously.

Cysts quite frequently originate in the glomus and are of several varieties, such as echinoccoccal, dermoid and hygroma, or they may contain blood, pus or serum, either form of which may exist in the glomus primarily or secondarily from the articulating surfaces of the bony segments, or the soft structures overlying the coccyx.

Cystic degeneration may also occur in any neoplasms that may affect the glomus. They may be congenital or acquired, acute or chronic, single or multiple, rupture into and through the posterior soft structures, into the rectum, vagina, urethra, bladder, uterus or peritoneal cavity.

Fistulae may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, open through the cutaneous structures into the rectum, its natural outlet, urethra, bladder, vagina, uterus, perineum or peritoneal cavity.

MALIGNANT.

Carcinomata may be primary or secondary, more often primary, because the glomus is so generally exposed when upon the tip of the coccyx, its normal position, where it may become irritated by the contents of the rectum, or injury of any character.

Sarcomata may be primary or secondary (usually primary) and at once invade any one or all of the surrounding soft or bony structures.

INJURIES.

Injuries to the glomus are contusions from within and without the rectum and many times trans-vagino-rectal by the head of the child during delivery, especially when the coccyx is ankylosed and pointing forward. This is probably the most frequent source of injury, though it may be by design or other forms of trauma.

SYMPTOMS.

Being the origin of many varieties of pathology, and because it is so enriched with nerve fibers and highly sensitized tissues immediately overlying the coccyx, and because of frequent pain and tenderness over the coccyx, the glomus must be considered symptomatically.

It is a preëminent factor in causing symptoms associated with the perineum, coccyx, uro-genital and rectal tracts, and it may be of far greater importance than the coccyx in the production of pain or irritability, whether local or general, in character, and intensity is increased with the character and rate of growth.

A diseased or injured glomus should always be suspected with the presence of rectal pain, irritation, or tenesmus which should be the signal for a thorough examination of the glomus.

SURGERY OF THE GLOMUS COCCYGEA.

With the evidence at hand there should be no reason for doubting the propriety of placing the glomus in the surgical category, even when it is not perceptibly enlarged. Especially would this statement be reasonable, if the glomus be for internal secretion. Until a time when its function is discovered, but little attention will be given to it in any way whatever, except so far as it may become involved with, or be the origin of growths serious in their consequences.

History.—There is no specific history pertaining to the surgery of the glomus, probably because it has not been dealt with in such a manner. There is, however, an occasional report of a case, where neoplasms of various kinds originating in the glomus, have been dealt with surgically, and then only when it had assumed a considerable size.

Indications for resorting to surgical measures when the glomus is slightly enlarged, are probably infection or when it contains blood, pus or serum, or at the beginning of enlargement due to any cause. Its destruction even when normal should be done whenever the coccyx or any of its associated tissues are removed, for any cause, especially when done for the cure or relief of malignant neoplasms.

Extirpation of the glomus alone may be necessary when it becomes a source of annoyance by hypertrophy, inflammation or degeneration from any cause.

Technique.—The removal of the glomus when of ordinary size is best accomplished through a posterior incision three inches in length, in the median line directly over the lower end of the coccyx.

Because of the various positions which it may occupy, number of bodies and their minuteness, the removal of several segments of the coccyx and the tissues immediately overlying them may be necessary to eliminate them.

Great care should be exercised to avoid injury such as partial or complete perforation of the wall of the rectum.

The method of anesthesia, dealing with the wound and the after-treatment is the same as that pertaining to coccygectomy.

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CHAPTER VIII.

THE COCCYX.

ANATOMY.

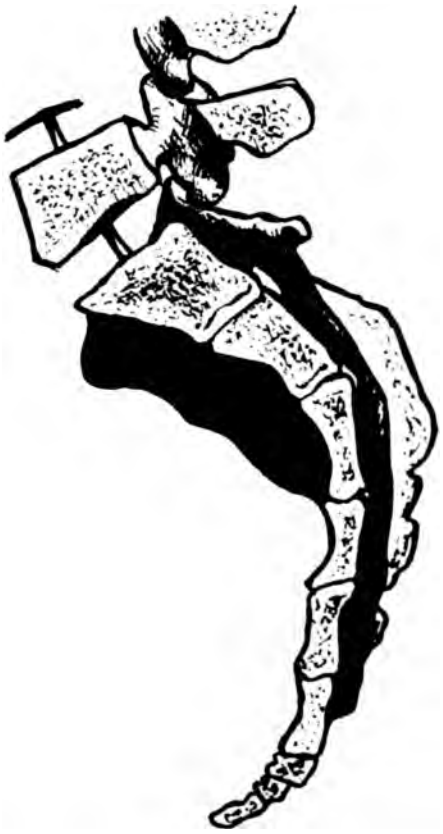
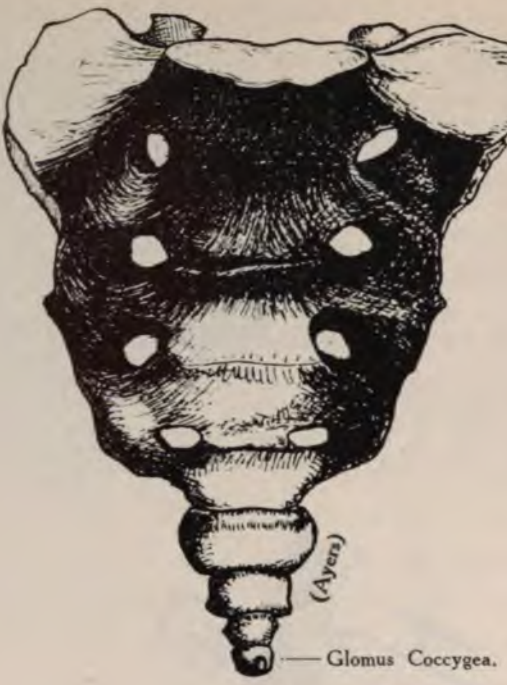


Fig. 40.



(Ayers)

Fig. 41.

OF THE many causes assigned for diseases of the rectum and prostate gland, there are perhaps none less frequently mentioned than deformity and diseases of the coccyx. It has been demonstrated in a number of cases of rectal, prostatic, bladder and urethral conditions, of a more or less serious nature, that the coccyx was directly or indirectly responsible for their existence, because of its close proximity to the rectal and genitourinary channels.

The possibility of one alone being affected must always be questioned. A review of their anatomical relations, especially those of their nervous and lymphatic structures, is essentially to prove the truthfulness of this assertion. While much has been said about the coccyx being a causative factor in rectal symptoms, nothing has been said about it being the cause of those diseases pertaining to the genito-urinary system, or those of the genito-urinary being the cause of rectal symptoms.

(Evolution.)

Evolutionary changes of the pelvis and its contents from quadrupedal to bipedal have not in many instances been altogether perfect, especially with the caudal extremity.

The coccyx in man is the caudal bony extremity composed normally of four tapering segments extending downward from the sacrum. Each joint is more or less movable and the tip slightly curved forward, varies somewhat in length and diameters, and covered with dense periosteum.

Coccygeus muscle is triangular in shape and supported externally by the sacro-sciatic ligament, with which it blends. It arises from the spine of the ischium, immediately above

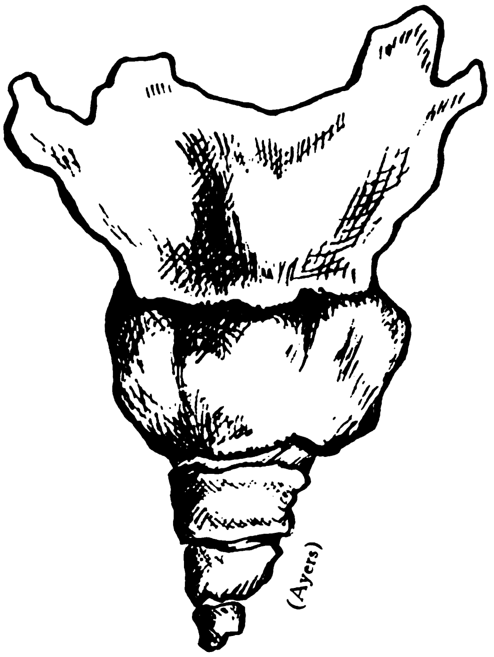


Fig. 42.

the origin of the levator ani muscle, and inserted into the side of the coccyx, the lateral sacro-coccygeal ligament and the last two sacral vertebrae.

Nerve Supply is from fourth and fifth sacral and coccygeal nerves.

Ligaments of the Pelvic Floor.

1. Anterior communicating.
2. Ilio Lumbar.
3. Anterior sacro iliac.
4. Greater sacro sciatic.
5. Lesser sacro sciatic.
6. Y Ligament of Bigelow.

Anterior communicating ligament is a wide band of longitudinal fibers extending from the front of the axis vertebra to the front of the upper segment of the sacrum and gradually increases in width from above downward.

Ilio lumbar ligament is a thickened lacunia of the fasciae lumborum extending from the tip of the transverse process of the last lumbar vertebra almost horizontally to the inner lip of the iliac crest.

Greater sacro sciatic ligament is triangular in shape attached to the posterior inferia spine of the ilium, besides being attached by the first segment of the coccyx is attached to the third, fourth and fifth segments of the sacrum and inner side of the ischial tuberosity below the groove for the tendon of the obturator muscle.

Lesser sacro sciatic ligament lies in front under the great sacro sciatic ligament triangular in shape, attached to the last two segments of the sacrum and the first segment of the coccyx and ischial spine. It is intimately associated with the coccygeus muscle and regarded as being derived from it by fibrous transformation of the muscle fasciculi.

Ilio Femoral or the Y ligament of Bigelow is a triangular set of fibers attached to the lower part of the anterior inferior iliac spine and the rim of the acetabulum and its base to the anterior intertrochanteric line of the femur.

Nerves. The posterior primary division of the sacral nerves with the exception of that of the fifth according to Piersol, emerges from the vertebral canal through the posterior sacral foramina. The first, second and third pass outward under cover of the multifides spinæ and divide into external and internal branches, while the external branches unite over the upper part of the sacrum with a similar branch of the fifth lumbar and with the fourth sacral nerve, form a series of loops called the posterior sacral plexus.

The posterior primary division of the coccygeal nerve does not divide into internal and external branches, but unites with the fourth and fifth sacral to form the posterior sacral coccygeal nerves, the fibers of which pierce the great sacro sciatic ligament and are given off to be distributed to the integument in the coccygeal region, after having passed along the margin of the coccyx. It is thus observed that these nerves are involved with any traumatic or pathologic lesions of the coccyx and that any such lesions should be eliminated before further attempt to differentiate any cause of pain that might be suspected or associated with them.

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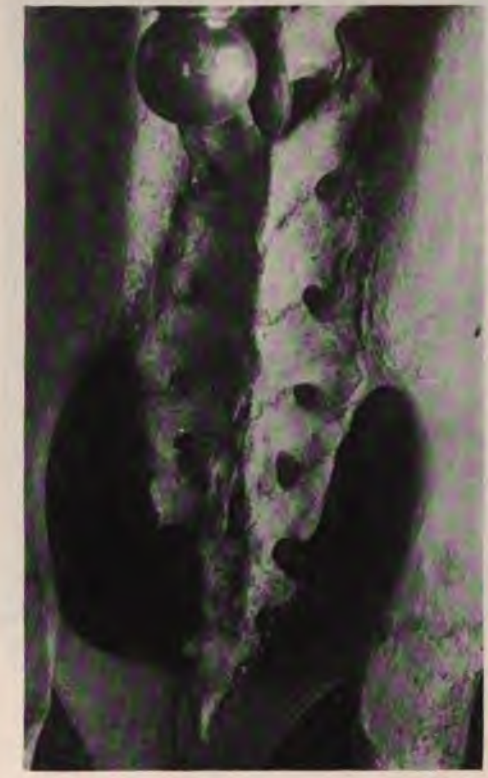

Fig. 43.—Posterior view of coccyx of Chimpanzee (Pat Roony the First, Cincinnati Zoo).

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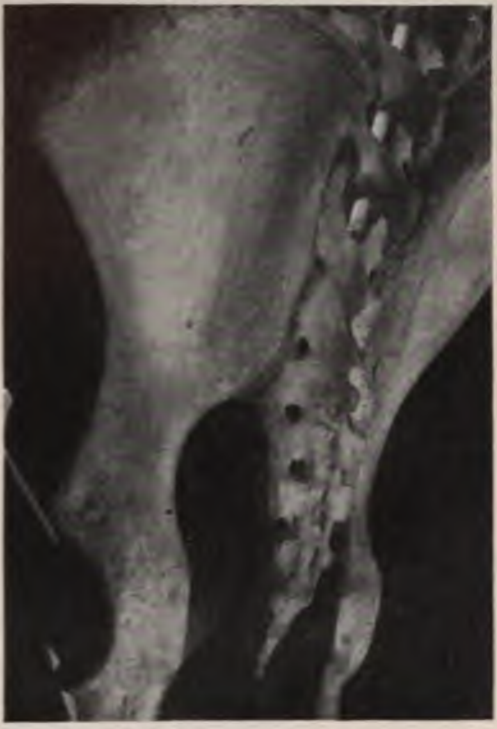


Fig. 44.—Lateral View of the Coccyx of Chimpanzee (Pat Roony the First, Cincinnati Zoo).

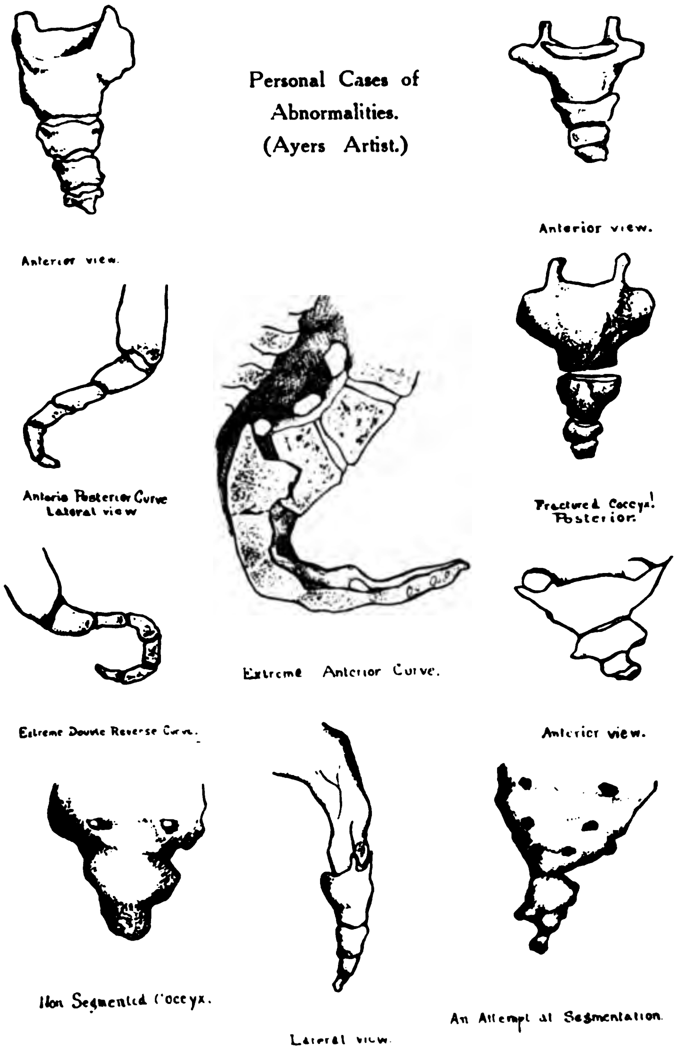
ETIOLOGY.

Anomalies, Diseases and Injuries.

Diseases { Anomalies.
  Benign.
  Malignant.

Injuries { Fractures.
  Ankylosis.
  Luxations.

ANOMALIES.



Personal Cases of Abnormalities. (Ayers Artist.)

Anterior view.
Anterior view.
Anterio Posterior Curve Lateral view
Fractured Coccyx! Posterior.
Extreme Anterior Curve.
Extreme Double Reverse Curve.
Anterior view.
Non Segmented Coccyx.
Lateral view.
An Attempt at Segmentation.

Fig. 45.

Anomalies of the coccyx being of such a diversity, especially in shape, must play a certain role in general symptomology. Any variation from normal to total absence must be determined before considering the subject in a general way. This may be done by palpation with the finger except in a few instances where segments are wanting, then it is difficult to define the limitations of the lower portion of the sacrum. The sacrococcygeal line may never be determined with the existence of such a condition.

Congenital defects of the coccyx.

1. Length.
2. Diameter.
3. Shape.
4. Flexibility.
5. Ankylosis.
6. Absence.

Length may vary from long to short. When long it may be due to increased length of the segments or sacrum, or both. Sometimes though infrequent, the segments may be increased to six or more in number.

Excessive length more frequently causes inconveniences than excessive shortness, which is due to the segments being diminished in length or number.

Diameters of the segments of the coccyx vary considerably from large to small. Any one or all may be excessive in the lateral or anterior-posterior measurements.

Shape may be regular or irregular, smooth or rough, sharp or blunt on the edges, or at the point.

Flexibility varies in degree and direction. It may be unilateral, bilateral, anterior, posterior or movable in all directions, and occasionally displaced downward by traction, a type referred to as floating coccyx.

Ankylosis may be partial or complete, straight, angular or curved laterally, anterior or posteriorly.

Absence. Several instances have been cited where the coccyx was congenitally wanting in part or its entirety, thus indicating that it is on the road to disappearance and that it is not an anatomic or physiologic necessity.

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DISEASES.

Benign. Malignant.

Neoplasms may be congenital or acquired, of many kinds and varieties, primary or secondary, vary in size, shape, number and location, develop in any direction, involve by extension any of the soft or bony structures of the lower pelvis and perineum.

History.

Zeddler, 1834, reported a case of steatoma of the coccyx, the first of its kind to be recorded.

Heschel, 1860, reported simple hypertrophy, and Clemantais, 1883, one of simple growth with fistulae. Erass, 1883, a congenital tumor, Jewett, 1884, an angioma, Barber, 1910, a tumor in the coccygeal region of an infant six months old, and Bod, 1910, a case of hernia of the spinal cord in the coccygeal region operated upon by Zenenk's method.

BENIGN.

Benign diseases of the coccyx may be congenital or acquired, primary or secondary, acute or chronic, remain small or assume a considerable size, of many varieties, and associated with angioma of the spinal cord and various other types of new growth to complicate their differentiation.

Coccygitis may be the result of injury or disease of the coccyx, tissues overlying or indirectly associated with the coccyx.

Chondromata may be congenital or acquired, primary or secondary, single, vary in size, shape, location, usually in the lower segments, slow or rapid in growth, remain quiescent, increase in size or disappear spontaneously, though this seldom occurs.

Osteomata may be congenital or acquired, primary or secondary, single or multiple, originate in any one or more of the segments or their periosteum and vary in size. The secondary growths extend from the sacrum and the primary growth of the coccyx may in turn become secondary in the sacrum.

Degeneration of one or all segments of the coccyx may be in the form of caries or necrosis due to tuberculosis (Caubet) syphilis, osteomolitis (Monnier) or injury. Kuss, 1909, reports a case of retro-anal fistula due to tuberculosis of the segments of the coccyx. Such degeneration may be secondary to disease of the sacrum or the soft tissues immediately surrounding the coccyx.

Tubercular degeneration may be acute or chronic, involve one or more segments, primary or secondary rupture into the rectal cavity, externally through the cutaneous structures, or extend into the sacrum and rupture in any direction.

Syphilitic degeneration may be congenital or acquired, primary or secondary, acute or chronic, occasionally destroy the coccyx without manifestations elsewhere, or the overlying soft structures posteriorly, laterally or anteriorly into the rectal cavity.

Osteomyelitic degeneration rarely occurs in the coccyx, but when it does occur, it is subject to the same rules concerning the destruction of its overlying soft structures. It, too, may be primary or secondary to the sacrum, which it usually involves when primary.

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Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple. When primary they originate from the articulating surfaces of the long segments, while those secondary may originate from the sacrum or the soft structures surrounding the coccyx. They may be tubercular, syphilitic, dermoid or hydatid, and contain serum, blood, pus, echinococci, or epithelial structures such as hair, teeth and sometimes bone known as teratoma or dermoid. Either of these forms may be congenital and all with the exception of the dermoid variety may be acquired.

Cysts may result from degeneration of osteomata or other benign or malignant neoplasms. Indeed, these are quite frequently their origin.

They may rupture externally, into the vagina, uterus, urethra, bladder, peritoneal or rectal cavity, usually into the rectum, remain open indefinitely to close spontaneously, or continue to form a permanent fistulous tract.

History.

Fistulae have been reported by Macdonald, 1867, Denuce, 1874, Couraud, 1883, and Jolly, 1887, the last named having seen a case in which the coccyx passed per anum, after having been subjected to fracture. Gehrung, 1888, reported a case of dislocation of the coccyx and Bailey, 1893, one of fracture in which an incorrect diagnosis was made. Le Roy, 1896, one of coccygeal fistula, and Gilles, 1903, of retro-expulsion of the coccyx.

Sinuses in the overlying soft structures almost invariably result from any injury or disease of the coccyx.

Fistulae may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, connect any part of the uro-genital, peritoneal or rectal tracts or coccyx, their strutcures, or the structures of the perineum.

The fluids passing through these fistulous tracts may be fecal, urinary, seminal, peritoneal, blood, pus or serum, from the uterine cavity, any bony tissue about or near the pelvis, or from a lesion within the soft structures of the perineum independently.

MALIGNANT.

Sarcomata. Carcinomata.

Malignant Neoplasms of the coccyx are numerous in variety and probably grow as rapidly as when other tissues or organs are similarly affected.

History.

Heretaux, 1882, reported a case of sarcoma of the coccyx and Raingeard, 1884, observed a case of sarcoma originating at the sacro-coccygeal junction with complete degeneration of the coccyx.

Many such cases have been observed before and since the time of these reports.

Sarcomata may occur in many varieties, develop slowly or rapidly and become of considerable sizes. They may be primary or secondary, involve the sacrum or secondary to the sacrum, originate in the segments, their synovial linings, periostial or other soft tissue coverings and in the form of teratomata.

Carcinomata are probably of rare occurrence in the coccyx but as its overlying soft structures are frequently its origin it is necessary to consider it especially in secondary involvement. They may be primary or secondary, vary in size, shape and location.

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INJURIES.

Fractures.

Injuries of this character in the male are usually caused by direct force applied from below or behind, while in the female, the pressure from the foetal head during delivery is an added cause.

History.

Fractures of the coccyx have been of many varieties and due to many causes. Cummenus, 1672, reported on its luxations, Faye, 1848, fracture, Boyer, 1852, fracture with reduction, and Cleaveland, 1853, on fracture due to difficult labor. Herschey, 1856, observed a case of simple exfoliation of the coccyx, Mouret, 1859, an incomplete luxation, Faye, 1861, one of fracture resulting in ankylosis, and Bellamy, 1878, one of gunshot wound of the coccyx and perforation of the rectum.

Fractures of the coccyx are due to injury or disease, and are classed as acquired causes. They too will produce symptoms which are associated with the uro-genital and rectal tracts

Fractures.

a. Simple.
b. Compound.
c. Comminuted.
d. Compound comminuted.

Simple fractures may occur in one or more segments, transverse, oblique, lateral or perpendicular, or they may be associated with fractures of the sacrum.

Simple fractures of the coccyx may be associated with a simple fracture of the sacrum, such a case having been observed in a woman 38 years of age as the result of a fall, the force of which was directed perpendicularly through the sacrum from below. This is the only case found recorded. The fracture apparently was transverse through the sacrum, while that of the coccyx was transverse through the articulating surfaces of the third and fourth segments. The pain resulting from the fracture was excruciating and only relieved by excision of the coccyx by local anesthesia. The pain and tenderness, however, continued for several months thereafter in the region of the sacral fracture.

Compound fractures may occur in one or more segments, even to being associated with that of the sacrum, and the laceration of soft tissue, extend laterally, posteriorly through the cutaneous structures, or anteriorly through the wall of the rectum.

Comminuted Fractures may involve one or more segments alone or be associated with that of the sacrum.

Compound Comminuted Fractures may occur in one or more segments alone, or with that of the sacrum and involve the soft structures laterally, posteriorly, or anteriorly through the wall of the rectum.

Either of the foregoing fractures may result in infection, and abscess which may rupture into the bladder, uterine or peritoneal cavity, the vagina or rectum, which is the most common course.

Ankylosis may be of any degree from slight movement to complete mobility, and in many positions from straight to curve, or angular, laterally, anteriorly or posteriorly.

Flexibility is more frequent in the female and ankylosis in the male. The latter probably being due to hardship and a smaller pelvis. Ankylosis is also produced by prolonged sitting posture.

Luxations may occur in one or all joints, even to complete separation from the coccyx, anteriorly, posteriorly or laterally, and such conditions are very much inclined to cause considerable irritation and pain. Their degree being influenced by occupation.

SYMPTOMS.

Pain $\left\{\begin{array}{l}\text{Coccyalgia.}\\\text{Coccygalgia.}\\\text{Coccygodynia.}\end{array}\right.$

The coccyx having not escaped the influences wrought by the anatomical changes in the perineum, should be considered an important factor in the causation of symptoms and surgical conditions, which are many times extremely complex in character and their relation to the rectal and uro-genital systems.

Sensory impulses pass upward, motor impulses downward, indicating that the coccyx plays the role of a disturber more than that of the disturbed. It is an offender, not defender, therefore must be the cause of complex symptoms especially because of its relations, attachments and exposed position.

The congenital or acquired absence of the coccyx does not interfere in the least with the function of muscular fibers which are attached to it normally.

The periosteum enveloping the coccyx may be primarily or secondarily affected by disease or injury or their consequences and for this reason must be considered independently in the causation of symptoms, though it may not have received proper recognition.

History.

Pain neuralgic in character, in the coccyx, has been recognized for many years but little was written about it until after Nott, 1844, of New Orleans, delivered an address upon the subject. Since then much has been said about the coccyx being a causative factor.

Scanzoni, 1861, Jenks, 1873, Worms, 1876, and Rockwell, 1877, each reported a case of pain due to injury. Hale, 1888, also had one due to disease of the segments.

Goodall, 1883, Sutton, 1888, Montgomery, 1895, Fletcher, 1897, and Courtois-Suffit, 1904, and 1910, reported coccygodynia of traumatic origin.

Many others have contributed most excellently to the sum total of our knowledge of this subject.

Pain and tenderness are probably the most common symptoms and they may be due to many causes direct or indirect, primary or secondary, such as injury or disease of the coccyx or nerves associated with it. It may be mild or severe, acute or chronic, constant or periodic, and appear at any age, in either sex, but more frequent in the female before fifty years of age. It is rare in the very young and old, and any degree of pain may exist with or without infection of any character or degree and when a deformed coccyx pulls on muscular fibers that are out of their normal position.

The coccyx when diseased or deformed quite frequently produces irritation of the rectal and urinary system in part or in general, and frequent urination and defecation associated with or without pain or tenesmus and general nervousness are quite commonly associated with its abnormal conditions. Tenderness is usually present with all and any irritation resulting from such a condition may result in infection and abscess with all of their sequellae at any point within the genito-urinary or rectal tracts.

Rectal or uro-genital pathology of any kind or degree may produce coccyalgia varying in severity and result in general or sexual neurasthenia, especially when severe in either the acute or chronic form.

COCCYALGIA.

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SURGERY OF THE COCCYX.

Excision {
Coccygectomy.
Coccygogectomy.
Tenotomy.

The propriety of removing a part or all of the coccyx for anomalies, diseases and injuries can not be disputed, nor can any question arise for doing so when pain or tenderness exists without these conditions.

History.

Coccygectomy has been done for deformity, disease and injury without danger or inconvenience. Nott, 1832, was first to report the removal of the coccyx. Thomas, 1835, removed it for parasitic infection, and Nott again, 1844, and Simpson, J. Y., 1861, were among the first to call attention to pain, disease and deformities of the coccyx.

Todd, 1874, cured neuralgia of the coccyx and pelvic viscera by coccygectomy. Blackwood, 1879, wrote on the necessity of accurate diagnosis of fractures at the sacro-coccygeal junction, drawn inward and the removal of the coccyx, and Stanford, 1879, and Burt, 1881, cases of pain cured by removing the coccyx.

Garretson, 1881, applied the surgical engine for the purpose of removing the coccyx. Guillet, 1882, reported a case of dermoid cyst removed from the ano-coccygeal region and Cottrell, 1883, reported having performed Garretson's operation (surgical engine) for the removal of the coccyx without disturbance of the perineum. Imlach, 1885, removed the coccyx for caries, and Welch, 1886, for neuralgia, Evans, 1887, cured mental symptoms by removing a necrosed coccyx.

Bowlby, 1889, reported three cases of coccygeal cysts, and Davis, 1892, one of extirpation of the coccyx in which was located a congenital cyst.

Kasley, 1893, records a case of irreducible luxation of the coccyx which was cured by extirpation, and Coe, 1895, one of dermoid cyst of the coccyx.

Adler, 1895, cured by excision of the coccyx constant pain resulting from an ununited fracture, while Brewer, 1896, states that the knife for coccygodynia is a failure, Liell, 1897, excised the coccyx in four cases of fracture and necrosis. Hirst, 1897, one for ununited fracture and Lange, 1897, one for dermoid cyst. de Vesian, 1907, injected alcohol (60 per cent.) about the coccyx for rebellious pain.

Courlois-Suffit & Bourgeois, 1910, interpretated the medico-legal question of surgical intervention in pain due to injuries to the coccyx, thus showing that there are many medico-legal phases concerning this bony appendage.

Berber in 1910 ablated successfully a hernia of the spinal cord in the region of the coccyx in an infant as was also done by Brad during the same year.

Until within the last ten years coccygectomy was done more frequently for neuralgia than for all other causes combined, but this operation grows rapidly in favor for fractures, ankyloses and flailed conditions, especially when they excite great general irritability without pain, neuralgic in character.

Technique.

Coccygectomy—Complete—Incomplete.

Complete. Removal of all the coccyx may be easily accomplished, with local or pulmonary anesthesia, preferably local, through a median incision extending from the first to the fifth segment, after separating the soft parts from the coccyx with a periosteome and dividing the bone with sharp forceps. The hemorrhage is usually insignificant, but drainage should always be instituted, because of the great possibility of infection of tissues so intimately related to the anus and vulva.

The same methods should be followed with partial excision of the coccyx, care always being observed in both instances not to injure the rectal wall. Sutures when possible, should be avoided because of the distress caused by their presence. They should when necessary be inserted close to the edges of the incised skin, but many such incisions will close by the infold of the cut edges without suture.

Gant, 1902, Diseases of the Rectum and Anus, second edition, pp. 168-172, tabulates 37 cases operated for injuries and tumors.

Personal Coccygectomies (Acquired).

3 Sarcoma, one 5½ lbs., one 7 oz., and one 2½ lbs.
2 Necrosis; one syphilis, one tuberculosis.
10 Fractures; four males, six females.
11 Neuralgia; six females, five males.
6 Ankylosis; four males and two females. Two right angle (males), one right angle (female).

Coccygectomy (Congenital).
1 long, sharp and flexible, (male).
2 long, sharp and flexible, (female), also 9 of recent date.
Total, 44.

TENOTOMY.

Tenotomy, suggested by J. Y. Simpson, 1861, is done by dividing subcutaneously the soft structures along the lateral borders of the coccyx. This method has received high commendation by quite a number of operators but the results observed after three such operations upon as many subjects, by as many operators, are not commendable.

Technique for tenotomy may best be accomplished by a posterior lateral incision extending through the cutaneous and other soft tissues overlying the coccyx, the incision being upon one or both sides, as necessity may require. With the left index finger within the rectum and upon the coccyx for a guide, the danger of incising the wall of the rectum may be avoided, as the tendons are divided at their attachments along the lateral bony borders. The point of a narrow bladed knife may be made to pass from the tip of the coccyx upward, or from its sacral border downward, there being no special advantage with either course, but the incision should extend about one and one half inches downward from the tip of the coccyx.

There may be difficulty in palpating the entire rectal surface of the coccyx, but this is only when it is very short or when the subject is extremely fleshy, or of great height. This difficulty is more frequently encountered in the male subject, because these conditions may be overcome by an examination of the female coccyx, with the finger in the vagina.

The after care of such posterior incisions is the same as for coccygectomy already described.

Trans rectal tenotomy is a method not to be recommended because the incisions are made through the rectal wall along the lateral borders of the coccyx, with a knife upon a long handle inserted through a speculum, thus being more difficult and dangerous because of the possibility of infection and hemorrhage, sufficient causes for condemnation.

Novocain or cocain injected subcutaneously will suffice for anesthetic purposes, the pulmonary method being seldom indicated for either excision of the coccyx or incision of its tendon.

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CHAPTER IX.

URETHRA.

ANATOMY.

WITH THE exception in length of the urethra, the urinary apparatus in the male and female are similar, especially alike from the lower portion of the bladder to and including the kidneys.

The urethra in the male is of two portions, approximately less than 2-3 c.m. long from the bladder to the opening of the ducts of reproduction, the membranous portion 1 cm. and the distal or spongy portion terminating with the external meatus, 14 cm. long and is lined with a mucous membrane throughout.

It contains much fibrous tissue with the muscular coat of circular and longitudinal fibers, intermingled with many lymphatic glands. Stripped muscle fibers are present in the outer aspect of the muscular coat of the urethra, forming a complete ring or sphincter in the upper part, while the lower fibers form the uro-genital sphincter.

An imperforate urethra, when complete in the unborn, is said by Deaver to always cause death before delivery, but two personal experiences do not bear out this statement.

Urethral blood supply is from the spermatic or ovarian internal iliac, visceral vessels, inferior renal arteries, inferior vesical and middle hemorrhoidal arteries.

Urethral nerves are from the pudic which carry sensory fibers to the mucous membrane and motor fibers to the striped muscle, and from the hypogastic and renal plexus of the sympathetic by way of the prostatic, cavernosus plexuses and pelvic sympathetic plexuses.

The compressor urethra is also dominated by branches of the pudic nerve. Its function is to constrict the membranous urethra in the male and flatten the walls of the vagina in the female.

The lymphatics of urethra in the male (Sappy) arise from a network attached to the mucous membrane from the utricle to the meatus urinarius. Posteriorly, the network formed by these vessels and by the anastomosis which unites them, is continued on the vesiculae seminales and the vasa deferentia.

In front it is continuous with the tortuous branchlets on the surface of the gland. This network has an exceptional arrangement; the larger and smaller branches which form it, follow the direction of the urethral walls by many transverse and oblique anastomoses; they unite very frequently and are grouped in parallel and unequal bundles, separated by longitudinal ridges. From this network emanate several collecting trunks which may be divided into four groups.

The only collecting trunks which Sappy mentions, are those which come from the mucous membrane covering the glands. They transverse the inferior wall of the urethra at the level of the fraenum, unite with the lymphatic trunks coming from the glans, and terminate in the same manner as those vessels.

The collecting trunks which come from the remainder of the penile portion vary in number. They emerge on the inferior surface of the penis, turn round the lateral surfaces of the corpus cavernosa and unite with trunks coming from the glandular portion. The majority run to and terminate in the same way as the latter, but some take an entirely different course, for instance, one of these vessels passes over the symphysis, runs between the two recti muscles, then turns directly to the left and terminates in the internal retro-crural gland. More rarely it may be found to terminate in the middle gland of the internal chain of the external iliac glands. Kuttner was the first to note the presence of the vessel, but he was wrong in believing that it came from the mucous membrane of the glans. A second collector passes underneath the symphysis and unites with the vessels coming from the bulbar and membranous portions of the urethra.

The lymphatics of the bulbar and membranous portions end in three systems of collecting trunks.

One of the vessels makes its appearance on the upper surface of the bulb in the angle formed by the divergence of the two corpora cavernosa. It embraces either the transverse artery of the bulb, or the artery to the corpus cavernosum, it then becomes a branch of the trunk of the internal pudic artery and terminates in the gland attached to the intra-pelvic portion of the trunk of this artery.

A second vessel runs toward the posterior surface of the symphysis and then behind the pubes to terminate in the internal retro-crural gland.

A third trunk ascends on the anterior surface of the bladder, and unites with the trunks coming from the inferior segment of this surface, and terminates with the latter in the middle gland of the internal chain of the external iliac glands.

The lymphatics of the prostatic portion pass into the collecting trunks which emerge from the glandular parenchyma.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases. { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies of the urethra may be congenital or acquired, primary or secondary, vary in length, diameter, regularity, location of external opening, relation to other structures, entire absence, number of channels, the distal opening may be into the rectal, vaginal, uterine or peritoneal cavity, one or all in the same individual, or there may not be any opening, as shown by an imperforate urethra, when the urethra is otherwise normal. Hypospadias and epispadias are not uncommon forms of embryonic ducts, and about 40 per cent. of those so afflicted are also defective mentally.

DISEASES.

Benign. Malignant.

BENIGN.

Benign diseases include those not cancerous in character, though they may be otherwise malignant.

Urethritis may be primary or secondary, acute or chronic, local or general, mild or severe.

Ulcers may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, in any tissue or portion of the urethra.

Papillomata in the urethra may be congenital or acquired, primary or secondary, single or multiple, vary in size, location, disappear spontaneously, develop sufficiently to cause obstruction, exist indefinitely and necessitate removal, after which they may again appear. Usually pedunculated.

Polypi may be congenital or acquired, primary or secondary, vary in size, shape, number, location, usually pedunculated, and sometimes disappear spontaneously.

Adenomata may be congenital or acquired, primary or secondary, single or multiple, vary in size, location, disappear spontaneously, or develop sufficiently to cause obstruction, usually have a broad base, exist indefinitely and necessitate removal, after which they may again appear upon the mucous membrane.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, location, disappear spontaneously, or develop sufficiently to cause obstruction, usually appear in the wall of the urethra, and develop in the surrounding tissues, external to the wall.

Tuberculosis may be primary or secondary, single or multiple, acute or chronic, in the mucosa or muscularis, and usually in the membranous or prostatic urethra; but rare in occurrence.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, in the mucous or muscular fibers of the urethra, usually in the membranous, prostatic or anterior portion.

Concretions and *Foreign Bodies* may enter from without or within, the most common source being from the bladder where they have formed or have escaped from the kidneys or ureters, though they may be formed in the urethra alone, especially in the prostatic portion, single or multiple and vary in size, shape and consistency.

Strictures may be congenital or acquired, primary or secondary, single or multiple, partial or complete, in any portion of the urethra, and result from injury or disease. Occasionally they will open spontaneously, but such a resolution is indeed rare.

Cysts may be congenital or acquired, single or multiple, primary or secondary, usually in any portion of the wall of the urethra, contain blood, pus, serum or urine, and rupture externally through the soft structures, into the rectum, vagina, uterus, bladder and occasionally into the peritoneal cavity.

Fistulae may be congenital or acquired, single or multiple, primary or secondary, acute or chronic, open externally upon the cutaneous structures, into the rectum, vagina, uterus, bladder, seminal ducts, or peritoneal cavity, one or all, at the same time, in one individual.

MALIGNANT.

Carcinomata are the most frequent forms of cancer, and they may be primary or secondary, usually primary, occur anywhere upon the mucosa, or muscularis, especially in the membranous or prostatic portion, the most frequent origin being in the mucosa.

Sarcomata, of rare occurrence, may be primary or secondary, usually primary and single, and occur more frequently in the muscularis, in any portion of the urethra, usually in the posterior.

INJURIES.

Lacerations, Incisions, Punctures may be single or multiple, complete or incomplete, from without or within any portion of the urethra, the result of accident or design. They may complicate the rectum, vagina, bladder, uterus, peritoneal cavity, perineal body, seminal ducts, testicles or scrotum.

SYMPTOMS.

Urinary (Male and Female).

Reflex disturbances in the urinary tract vary slightly in the sexes because of anatomical arrangement, but the variation is so slight that it is almost impossible to define them physiologically. It will therefore be necessary to consider each of the four divisions of the tract singly and collectively for a more perfect understanding of their correlated symptoms.

Pain, induration and tenderness are first and most prominent in any of the anomalies or diseases ascribed to the urethra but localized or general pain is not always an indication that its cause is in any of the urethral tissues. The intimate relation of these structures with those of the erectile body so rich in nerve fibers, both sensory and motor, and blood and lymphatic vessels give to it a very high degree of sensibility.

Pathology of any character, especially the obstructive form, including foreign bodies and concretions in the urethra and the bladder, ureters and kidneys, may cause impulses to be transmitted downward to the distal end of the erectile body in both sexes because the same group of nerves are carriers of impulses to and from the kidneys, ureters, bladder and prostate.

It would therefore seem unreasonable for such a complex relation of sensory and sympathetic nerve fibers to carry impulses at all times, independently. The motor fibers of the pudic nerve which dominate the compressor urethra in the male, the function of which is to constrict the membranous urethra in the male and flatten the walls of the vagina in the female, are exemplifications of their duality.

Urinary disturbances of the urethra must necessarily exist when the upper tracts are primarily involved because the urethra is the channel through which the urine with its constituents must escape. These disturbances may exist independently and therefore possess the same indications, but the disturbances which the bladder, ureter and kidneys produce, are more severe and serious. The urethra being the most available portion of the urinary tract for examination, does not necessitate so great a classification of symptoms for diagnosis except so far as its physiological effects upon other tissues and organs are concerned.

Vascular changes are proportionate with the rate of pulse, though there may not be any perceptible difference in the earlier periods.

Arterio-vascular disturbances in the *urethra* are quite common and varied, as they are in the general urinary system. Their progress and severity are determined by the rate and quality of the pulse especially when the *bladder, ureters, or kidneys* are involved by infection of various kinds with or without increase of temperature. The pulse may intermit or be otherwise irregular, such being especially observed in senility.

Urethral changes are less likely to cause such disturbances though they may do so when far advanced, especially in severe urethritis due to gonococci.

CHAPTER X.

BLADDER.

ANATOMY.

THE BLADDER has been constant from the beginning with all forms of animal life, that it may receive urine indirectly by means of folds of mucous membrane when the ureters do not enter directly into it, or directly when they enter the bladder. It is largest at its base and varies in size and shape, very distensible, located in the extreme lower pelvis and richly endowed with blood, lymphatic vessels, glands and nerve fibers.

It varies in thickness because of being distended and is composed of mucosa within, a serosa without, and muscular fibers between the two layers.

Its blood, lymphatic and *nerve supplies* are alike in the male and female.

The blood supply is from the superior middle and inferior vesicle, obturator and internal pudic arteries and branches of the uterine and vaginal arteries in the female.

The venous plexus about the organ is larger at its base and communicates with the prostatic plexus from the vesico-prostatic plexus which empties into the internal iliac vein.

Its fundus or base, spermatic ducts, and recto-vesical pouch are directed toward the rectum, and in the female, is attached to the anterior vaginal wall.

The arteries are chiefly the inferior and superior vesical from the anterior division of the internal iliac, reinforced by branches from the middle hemorrhoidal and twigs from the internal pudic and obturators.

Nerves include sympathetic and spinal fibers; the sympathetic follow the arteries and join the vesical branches from the sacral plexus which is derived from the 3rd and 4th and possibly the 2nd sacral spinal nerves.

The larger nerves divide in the outer fibrous coat of the bladder, into small fibers that are connected with ganglia especially near the ureters.

The bladder in general is but a trifle sensitive, but it is very sensitive about the entrance of the ureters into the bladder at which point nerve fibers predominate.

Fibers from the pelvic plexuses of the sympathetic and third and fourth sacral nerves supply the urinary bladder, while fibers from the sympathetic plexuses supply the ureters and fibers from the hypogastric plexuses of the sympathetic with central fibers mingled with Pacinian corpuscles, inhibit the prostate gland.

The lymphatics of the bladder. The only network of origin which exists in the bladder is an intramuscular one. The emergent vessels of this network end in a second network placed on the outer surface of the vesical muscle, under the peritoneum of the umbilico-praevesical fascia. The course and termination of the collectors of this network vary according to their situation on the anterior or posterior surface of the bladder.

Anterior surface. The collecting trunks coming from the anterior surface form two groups. The trunks coming from the inferior segment of this surface run almost transversely outward, and pass into a gland placed on the lateral surface of the pelvic cavity, between the external iliac vein and the obturator nerve, a few millimeters behind the cervical ring. The trunks which come from the superior part of the anterior surface are remarkable for their sinuosities. They run upwards and outwards, cross the hypogastric artery, passing either above, or not frequently below it, and eventually terminate in the middle gland of the middle chain of the external iliac group. In the course of these lymphatic trunks are placed small glands, which are only visible after injection, they belong to the group of interrupting glomular nodules. Some of these glands are placed in front of the bladder (pre-vesical glands), they may become hypertrophied in certain pathological conditions (Bazy) and may form the starting point of certain prae-vesical phlegmons. Others are placed at the spot where the lymphatic vessels cross the hypogastric artery, (latero-vesical glands. Waldeyer, Gerota).

Posterior surface. The trunks which come from the posterior surface, also form several groups.

The trunks which come from the superior portion of this surface run outwards describing several curves. They cross the hypogastric artery, where they traverse some small lateral-vesical glands, and terminate in the external iliac gland in which the superior lymphatics of the anterior surfacc also end.

Other trunks pass backwards following the course of hypogastric artery, and end in a gland which is situated like the preceding, on the external iliac vein, but more posteriorly to it, immediately in front of the bifurcation of the common iliac artery.

Other trunks which come from the middle segment of the posterior surface, end in the hypogastric glands.

Others finally arising from near the neck of the bladder run directly backwards, and crossing the lateral surface of the rectum, ascend onto the anterior surface of the sacrum and terminate in the glands situated in the angle of bifurcation of the abdominal aorta, in front of the promontory.

The vesical lymphatics end in the glands of the bifurcation of the aorta. We may add that the prae-vesical network is continuous with the network which surrounds the prostate, the vesiculae seminales, the vasa deferentia, and the terminal parts of the ureters.

Etiology.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases. { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, inverted, exceedingly large or small, entirely absent, open upon the abdominal wall, (exstrophy), abnormally placed in the pelvis, partially or completely septinated, or contain two or more cavities, when the urachus is present.

Ectopy is evidenced by the bladder protruding through a cleft in the abdominal wall.

DISEASES.

Benign. Malignant.

BENIGN.

Cystitis may be primary or secondary, acute or chronic, local or general, mild or severe.

Atrophy may be congenital or acquired, primary or secondary, local or general, usually in all of the structures.

Hypertrophy may be congenital or acquired, local or general in any one or all of the structures, usually all, primary or secondary.

Ulcers may be congenital or acquired, primary or secondary, single or multiple, vary in depth, due to trauma or infection, acute or chronic, in any tissue or portion of the bladder wall, cease or continue in size or disappear spontaneously.

Fissures at the neck may be congenital or acquired, usually acquired, acute or chronic, single or multiple, primary or secondary, usually in the mucosa, sometimes the muscularis.

Papillomata are probably the most frequent forms of new growth in the bladder. They may be congenital or acquired, single or multiple, upon any portion of its inner surface, develop to considerable size, remain quiescent or disappear spontaneously, though such a resolution seldom occurs.

Adenomata frequently found in the bladder, may be congenital or acquired, single or multiple, (usually multiple), upon any portion, small or large, cease to develop but seldom disappear spontaneously.

Polypi may be congenital or acquired, single or multiple, large or small, pedunculated, vary in shape and location.

Fibromata may be congenital or acquired, single or multiple, usually single, in any portion of the muscularis, where they originate, remain small, become large, cease to grow, or disappear spontaneously.

Myomata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Angiomata may be congenital or acquired, primary or secondary, acute or chronic, vary in size, number and location and disappear spontaneously.

Lipomata may be congenital or acquired, primary or secondary, vary in size, shape, location and number.

Chondromata may be congenital or acquired, primary or secondary, vary in size, shape, location and number.

Tuberculosis may be primary or secondary, single or multiple, acute or chronic, involve any part or all of the bladder, or disappear spontaneously.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, in any portion or all of the bladder.

Parasites may be congenital or acquired, primary or secondary, without or within, become encysted, or remain in the bladder cavity, the most common being cysticircus. Any form may be temporary or become permanent.

Concretions may be congenital or acquired, primary or secondary, single or multiple, vary in size, location, encysted in any portion of the wall of the bladder, especially in its lower extremity, originate in the kidney or ureter, and pass into the bladder.

Foreign Bodies may be introduced by accident or design, be single or multiple, enter from without or within, through the urethra, surrounding soft structures, ureters, uterus or peritoneal cavity and escape from the bladder into any one or more of these cavities or tissues.

Cysts may be congenital or acquired, single or multiple, large or small, in any portion of the bladder wall, contain pus, blood, serum, urine or parasites, such as ecchinococci, or other forms, rupture into the rectum, vagina, uterus, peritoneal cavity, bladder, urethra, or soft structures externally.

Fistulae may be congenital or acquired, single or multiple, primary or secondary, acute or chronic, vary in size and length, through any portion of the bladder wall, open externally through the soft structures into the rectum, vagina, uterus, peritoneal cavity, urethra or seminal vesicles.

MALIGNANT.

Carcinomata may be primary or secondary, usually primary and single, in any portion of the bladder wall and of slow or rapid growth.

Sarcomata may be primary or secondary, usually primary and single, upon any portion of the bladder wall and slow in their development.

INJURIES.

Herniae of the bladder, usually in the groin, may be congenital or acquired, into the *rectum*, *vagina*, through the *inguinal canal* or abdominal wall, of rare occurrence, but sufficiently frequent to require consideration. The *inguinal* variety is almost always unilateral, the *perineal* usually due to pregnancy, the *urethral* is the inversion of the bladder, occurs only in the female, the *crural* form exceedingly rare.

Ruptures may be by accident or design, primary or secondary, complete or incomplete, single or multiple, due to force applied from without or within, in any portion of the bladder wall, extend into the peritoneal, uterine, rectal or vaginal cavities, complicate ureters, Fallopian tubes, bloodvessels, nerves, lymphatics, intestines, cutaneous structures or abdominal wall.

Incisions may be by accident or design, single or multiple, penetrating or nonpenetrating, from without or within, to the same degree as rupture.

Punctures may be by accident or design, single or multiple, penetrating or nonpenetrating, without or within, through any of the overlying structures, involve any of the associated organs, through the rectum, vagina, urethra, or peritoneal cavity.

SYMPTOMS.

Symptoms pertaining to the *urinary bladder* are quite varied and uncertain, especially because of the great variety of conditions found within its structures, and the adjacent soft tissues, and because of their inhibition being from the same source, and similar in both sexes. Any one of the conditions herein ascribed, involving the bladder, may cause subjective symptoms identical in character.

It is inhibited by both motor and sensory fibers from the pelvic plexus of the sympathetic, and third and fourth sacral nerves, and therefore must be a source of great general disturbance within the uro-genital and rectal tracts, especially as their fibers coalesce with the motor and sensory fibers of other nerves. The bloodvessels and lymphatics alike coalesce with their associates, adding greatly to this general disturbance.

Local manifestations in the *bladder* such as tenderness and pain may or may not vary with the degree of involvement as may those that are general, which are indicated by increased sensibility, pain, chill, headache, shock, with added nausea and vomiting.

The *effect of neuroses* of any character upon the urinary system and its associated structures or organs, is shown by the frequent desire to void urine. Incontinence or retention may also occur as may tenesmus or the sensation of burning be induced by nervous irritability.

CHAPTER XI.

URETER.

ANATOMY.

THE URETER is composed of mucous, muscular and fibrous coats rather thick and white.

The mucous membrane has many layers of epithelial cells, and the muscular coat is composed of unstriated muscle fibers in bundles which are separated by connective tissue and arranged longitudinally and circularly.

The fibrous coat varies in thickness at different levels, the lower part blending with the connective tissue which lies among the muscle fibers forming the sheath of the ureter.

In the female about three inches can be palpated through the vagina.

The ureters extend from the bladder backwards, outward and upward to the base of the broad ligaments and toward the lateral walls of the true pelvis.

The ureters are behind the peritoneum covering the psoas muscle and in front of the common iliac arteries, and in the true pelvis in front of the internal iliac arteries, entering the bladder about one inch apart.

Blood supply is from the renal and spermatic arteries in its abdominal portion and the superior vesical and the middle hemorrhoidal vessels in its pelvic portion.

Nerve supply is through the renal, the spermatic and hypogastric plexuses.

Lymphatics of the Ureter. Our knowledge of the lymphatics is still imperfect. Sappy was able to inject them only in the horse, and met with them only in the muscular coat. In the course of his injections of the vesical lymphatics several times he has seen the subserous network of the bladder extend itself a few millimeters round the ureter. The lymphatics of the ureter end in multiple collecting trunks which pass to the neighboring glands.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, vary in length, size, origin, entrance into the bladder, course and relation to other structures, one or both absent, the right enter the bladder upon the left, the left upon the right side, or anywhere upon the surface.

DISEASES.

Benign. Malignant.

BENIGN.

Urethritis may be primary or secondary, acute or chronic, and involve any part or all of the mucosa.

Tuberculosis may be acute or chronic, primary or secondary, in any portion, in the mucosa or any of the fibers within the wall. Primary tuberculosis, however, is much less frequent than the secondary form, which is usually from the kidney or bladder, especially the kidney.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, in any portion of the ureter, but more frequently near the extremities, in which instance it is usually secondary.

Papillomata may be congenital or acquired, usually acquired, primary or secondary, single or multiple, in any portion, but most frequently at the extremities, destroy the lumen, cause the formation of concretions, strictures or general destruction.

Adenomata may be congenital or acquired, single or multiple, not pedunculated, in any portion, but most frequently at the extremities, destroy the lumen, cause concretions, strictures or general destruction.

Fibromata may be congenital or acquired, single or multiple, large or small, originate in the muscular tissue of the ureter, destroy the lumen, and cease to grow at any stage of development.

Prolapsus may be congenital or acquired, acute or chronic, into the bladder, vagina, through the inguinal or femoral ring.

Concretions may form within or enter through the kidney and foreign bodies through the peritoneal cavity, or from without through the overlying structures, single or multiple, primary or secondary, remain or pass into the kidney, bladder, peritoneal, rectal, vaginal, uterine cavity, or exterior through the overlying soft structures.

Cysts may be congenital or acquired, single or multiple, primary or secondary, parasitic or non-parasitic, within the lumen, muscular coat of the ureter, rupture into the ureter, kidney, bladder, vaginal, uterine, rectal, peritoneal or intestinal cavities, through the cutaneous structures, Fallopian tubes or blood vessels.

Strictures may be congenital or acquired, single or multiple, primary or secondary, partial or complete, vary in size, shape, and in any portion.

Fistulae may be congenital or acquired, single or multiple, primary or secondary, acute or chronic, in any portion of the ureter, open into the rectum, vagina, uterus, Fallopian tubes, peritoneal or alimentary cavities, or through the overlying soft cutaneous tissues.

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, in any portion or structure.

Sarcomata may be primary or secondary, single or multiple, in any portion, especially the muscularis, slow or rapid in growth, depending upon their character and origin, the result of accidental or induced injury, the presence of concretions, foreign bodies, or the introduction of sounds, and of myxomatous, rhabdomyomatous, or other varieties.

INJURIES.

Ruptures of the ureter may be primary or secondary, single or multiple, partial or complete, longitudinal or circular, lateral, posterior or anterior, into the peritoneal, uterine, rectal or vaginal cavities, bladder, surrounding soft structures, or kidney.

Punctures may be induced from within, primary or secondary, through the kidney or bladder, result from foreign bodies, concretions or introduction of sounds, through the peritoneal, uterine, rectal, or vaginal cavities, or overlying soft structures, and in any portion of the ureteral wall.

Incisions may be accidental or induced, primary or secondary, longitudinal, or circular, in any portion of the ureteral wall, kidney, bladder, through the rectal, vaginal, uterine, or peritoneal cavities, or through the overlying soft structures when induced for extra-peritoneal ureterotomy.

SYMPTOMS.

Symptoms pertaining to *ureteral* conditions herein described too frequently fail in diagnosis, especially the symptoms of pain and tenderness, two of the prominent and constant indications, because the sensitive nerve fibers which supply the ureter are intimately associated with those of the kidney and bladder and their adjacent structures, thus permitting similar impulses due to irregular conditions within them to be transmitted through their nerve fibers. This difficulty obtains with the existence of occlusion which greatly aggravates all others and becomes the most prominent factor.

Pain and tenderness in the *ureter* predominate in local manifestations but unfortunately they are not diagnostic, especially in the female, but when they persist with general disturbances such as chill, headache, shock, perspiration, nausea and vomiting, sufficient evidence is deduced to suspect ureteral conditions. There is probably no part of the genito-urinary tract so difficult to determine symptomatically.

Tenderness may indicate many conditions or none at all because its degree varies with the closeness of the ureteral lesion to the bladder which increases intensity. Bladder symptoms of every kind, especially those due to irritation, frequent urination and tenesmus are very confounding. The lower male ureter may sometimes be palpated through the rectum, but the point of lesion is not then made certain.

CHAPTER XII.

KIDNEYS.

(Male and Female.)

ANATOMY.

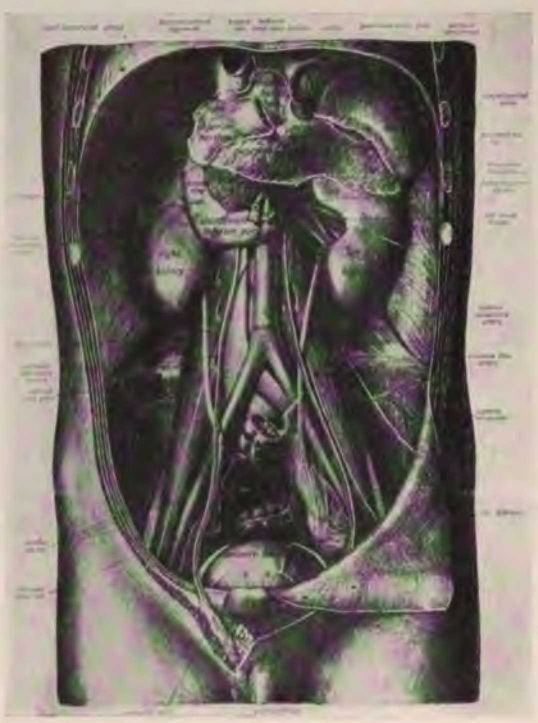


Fig. 46.

KIDNEYS exceed in weight that of the other urinary tissues combined, but their consideration will be but slightly more than passing because their blood, nerve and lymphatic systems are independent of the other portion of the urinary apparatus and far distant from the pelvic tissues.

It might be said that there is no physiologic relation of the kidneys to the other portion of the urinary tract, except that of a mechanical character, because of their independent relation.

Blood Vessels. There should be one renal artery for each kidney, but there may be two or even more and the right is greater in length.

Vessels supplying the kidney do not anastomose with each other as each end artery provides for a particular area of renal substance (Piersol).

The nerves of the kidney are derived from the renal plexus formed by contributions from the solar and aortic plexuses and the least splanchnic nerve.

The plexus accompanies the renal artery which it surrounds. Within the latter is formed a well-marked perivascular network from which a number of twigs are given off to supply the walls of the pelvis and ureter, while the majority accompany the vessels into the kidney.

Because of the almost total absence of sensory nerve fibers in the kidney tissue, very little if any pain, can be produced within from any cause except obstruction.

The lymphatics of the kidneys arise from two networks, one superficial and the other deep.

The superficial network, which was observed by Mascagni, has not been seen by Ludwig and Kolliker. The new classical researches of Leichmann and Stahr, however, leave no doubt as to its existence; but it is extremely difficult to infect. Immediately underneath the capsule, it is remarkable for the tenuity of its meshes.

This network two systems of collecting trunks arise which, following Sappy, we may divide into convergent and divergent. The convergent empty themselves into the collecting trunks of the deep network either by immediately sinking into the depth of the kidney, or by running under the capsule only to join the deep collecting trunks near the hilum, the divergent trunks perforate the fibrous capsule, and pass into the network which we shall describe further on when dealing with the fatty capsule of the kidney. The arrangement of the deep network eventually gives origin to large collecting trunks, varying in number from four to seven, which leave the kidney at the hilum. These trunks course around the artery and the renal vein. They are usually satellites of the vein, some running on into anterior, and some on its posterior surface. The mode of termination of the renal lymphatics varies on the two sides. On the right, we may divide the vessels into anterior and posterior. The anterior trunks run in front of the renal vein, and pass downwards and inwards and terminate in the pre-venous mass of right juxta-aortic glands. They usually terminate in the group of the above mentioned glands, which is situated on the anterior surface of the vena cava, immediately below the opening of the renal veins into the inferior cava, but one of them may often be seen to end in a gland belonging to the same group, placed much lower down, close to the bifurcation of the aorta. It is equally common to see one of these trunks end in a gland of the pre-aortic group. The posterior trunks are shorter than the preceding, and are placed behind the vein and renal arteries. They terminate in two or three large glands situated behind the inferior vena cava, in front of the right pillar of the diaphragm. These glands belong to the retro-venous group of the right juxta-aortic glands. Their different vessels pass through the right pillar of the diaphragm traversing it through the same orifice as the great splanchnic nerve, and terminate in the thoracic duct. On the left, the collecting trunks, which leave the kidneys at the hilum terminate in four or five glands which belong to the juxta-aortic group of the corresponding aorta. The highest of these glands are situated in front of the left pillar of the diaphragm, through which their efferent vessels pass on their way to join the thoracic duct. To sum up, the lymphatics of the kidneys end principally in the juxta-aortic glands of the corresponding side and accessorily in the pre-aortic glands. In any case it is, if not absolutely incorrect, at least insufficient, to state that the lymphatics of the kidneys terminate in the glands placed at the level of the hilum of these organs. At the level of the hilum, however, we may meet with some small glandular nodules, but by reason of their contiguity and their small size, they should be regarded as belonging to that variety of gland which we have described above as the interrupting glandular nodule (*Schaltdrüsen*) and which it is important to distinguish from the regional glands which are much more constant in their presence and situation (Stahr). One of these nodules is, however, distinguished by its relative frequency and by its fairly constant situation beneath the right renal vein, in the angle which this vessel forms with the inferior vena cava.

The fatty capsule of the kidney possesses a rich lymphatic network which has been recently described by Stahr. The efferents of this network end in the same glands as the collective from the kidney itself. The network of the fatty capsules communicates, as we have seen, with the lymphatics of the kidney, and it is not rare to find during the progress of epithelial cancers of this organ, lines of new growth in the fatty capsule.

Lymphatics of the Suprarenal Capsule.—The lymphatics of the suprarenal capsules, whose mode of origin will be studied together with the structures of these organs, end in four or five collecting trunks, which emerge at the same point as the large central vein, and terminate in the juxta-aortic glands of the corresponding side. In several subjects, these collecting trunks have been seen to perforate the pillars of the diaphragm and end in the glands placed between the posterior surface of these pillars and the vertebral column.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, vary in shape, size, position, number and relation to other structures. One or both may be absent, which last event would preclude the possibility of life existing after birth for any great length of time, but the absence of one does not prevent the continuance of life. One or both kidneys may be excessively lobulated, large or small, and functionate normally in amount and frequency.

One or more ureters originate in the same kidney and the proverbial horseshoe kidney, probably exists as one kidney.

DISEASES.

Benign. Malignant.

BENIGN.

Nephritis may be congenital or acquired, primary or secondary, unilateral or bilateral, acute or chronic, local or general, mild or severe.

Tuberculosis may be primary or secondary, acute or chronic, single or multiple, more frequently primary, infected simultaneously, at different times, or one alone affected, appear in any portion, disappear spontaneously, or continue to its destruction.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, in any portion of one or both simultaneously.

Papillomata may be congenital or acquired, primary or secondary, involve any portion or all of one or both, usually both.

Adenomata may be congenital or acquired, primary or secondary, unilateral or bilateral, single or multiple, vary in size, shape, number and location.

Lipomata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Rhabdomyomata may be congenital or acquired, primary or secondary, vary in size, shape and location.

Concretions may be congenital or acquired, primary or secondary, single or multiple, remain in the pelvis, escape into the cortex, and vary in size (from sand-like grains, to several ounces), shape and number.

Fistulæ may be congenital or acquired, single or multiple, primary or secondary, acute or chronic, originate in the pelvis, or cortex, appear in the peritoneal cavity, upon the cutaneous surface, through the overlying soft structures, pleural cavity, stomach, intestinal tract, rectum, vagina, bladder or Fallopian tubes.

Floating kidney may be congenital or acquired, primary or secondary, unilateral or bilateral, vary in degree; it is usually the right kidney and is more frequent in the female.

Cysts may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, in any portion, the pelvis alone, contain blood, pus, serum, occasionally ecchinoccocci, or dermoid material, rupture into the ureter, peritoneal, alimentary or pleural cavities, Fallopian tube, uterus, bladder, rectum, vagina or overlying soft structures.

MALIGNANT.

Carcinomata may be primary or secondary, usually primary, and single, and extend into the ureter before involving the surrounding structures.

Sarcomata may be primary or secondary, usually primary, seldom multiple, and extend into the adjacent soft structures.

INJURIES.

Rupture may be accidental or induced, single or multiple, primary or secondary, from causes without or within, longitudinal or circular, each varying in extent, partial or complete, into the pleural or peritoneal cavity or overlying soft structures.

Lacerations may be accidental or induced, primary or secondary, single or multiple, complete or incomplete, from without or within, in any direction, involve the peritoneal, pleural, or alimentary cavity or organs.

Punctures may be accidental or induced, primary or secondary, single or multiple, in any part of the organ, from without or within, through the peritoneal cavity or the overlying soft structures, the result of instrumentation, through the ureter or pelvis of the organ.

Incisions may be accidental or induced, single or multiple, primary or secondary, penetrating or non-penetrating, from without or within, in any portion of the organ, longitudinal or circular and involve the surrounding tissues.

SYMPTOMS.

Symptoms of kidney irregularities are highly intensified because of its size, function and intimate association with organs of equal importance, namely the liver, pancreas, stomach, duodenum, biliary tract, and diaphragm, each of which is supplied with numerous sensitive nerve fibers, many of which are from the same origin, but few of which have even slight association with the perineal group.

It is thus observed that nephritic symptoms are almost independent of those found in the uro-genital tract which is so thoroughly dominated by the sympathetic and sacral plexuses. For this reason nephritic symptomatology cannot be placed in parallel lines with that of the pelvic organs and perineum. But as all kidney secretions, both normal and abnormal, naturally drain through the ureters into the bladder to make their exit through the urethra, primary symptoms are produced within these organs and tissues which cause symptoms of all combined.

The general influence of *renal pathology* is usually severe, and local manifestations, such as pain, and tenderness, are fair indications of beginning renal disease, but when these exceptions are increased in severity, and associated with chill, headache, shock, perspiration, nausea, and vomiting, their intensity is lost.

CHAPTER XIII.

ERECTILE BODY.

(Penis Clitoris.)

ANATOMY.

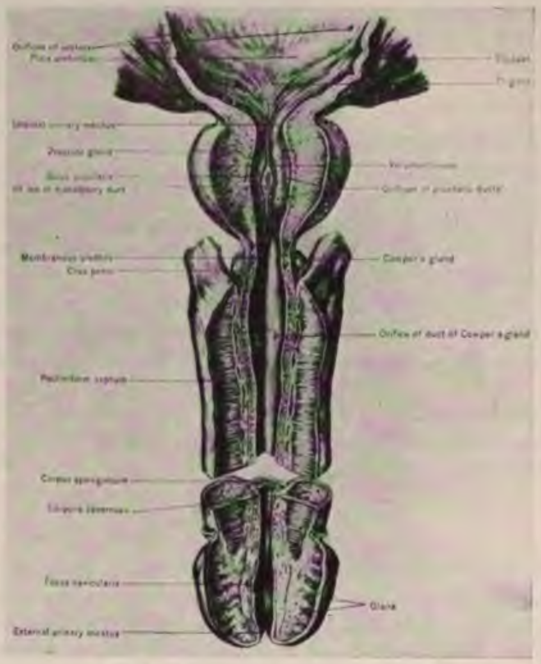


Fig. 47.—Male urethra cleft dorsally (Deaver).

THE ISCHIO-CAVERNOSUM, also named erector penis, and erector clitoris, represents the lateral portion of the sphincter cloacae. The two muscles occupy the lateral parts of the superficial perineal interspace, each arising from the base of the tuberosity of the ischium enclosing the base of the crus penis-clitoris as in a sheath and passing forward to be inserted into the corpus cavernosum. The muscle in the female differs from that in the male only in size.

Its function is to compress the corpus cavernosum and thus assist in producing or maintaining erection of the penis or clitoris.

The artery of the corpus cavernosum (profunda penis in the male, profunda clitoris in the female) is usually the larger of the two terminal branches. Immediately after its origin it enters the crus penis and runs forward in the corpus cavernosum which it supplies.

Bulbo Cavernosum differs in its relations in the two sexes, being in the male the accelerator urinæ, the two muscles of the opposite sides being united in a median fibrous raphe which extends forward from the central tendon of the perineum over the bulbo and corpus spongiosum. Arising from this raphe the fibers are directed laterally and forward over the bulb and corpus spongiosum to become inserted into the under surface of the inferior layer of the uro-genital trigone and into the fibrous sheath of the corpus cavernosum, some of the more anterior fibers being continued dorsally to be inserted into the fascia covering the dorsum of the penis and forming what has been termed the muscle of Hauston, or compressor venæ dorsalis penis, and sphincter vaginæ in the female.

The artery to the bulb, a branch of which is usually of relative large size, is given off between the layers of the triangular ligament. It runs transversely inwards along the posterior border of the compressor urethra, and then turning forwards a short distance from the outer side of the urethra, pierces the anterior layer of the triangular ligament and enters the substance of the bulb. It passes onwards in the corpus spongiosum to the glans where it anastomoses with its fellow and with the dorsal arteries of the penis. It supplies the compressor urethra muscle, Cowper's gland, the corpus spongiosum, and the penile part of the urethra. In the female this artery supplies the bulb of the vestibule.

The dorsal artery of the penis passes forward between the layers of the suspensory ligament, and runs along the dorsal nerve immediately to its outer side, whilst it is separated from its fellow of the opposite side by the median deep dorsal vein. It supplies the superficial tissues on the dorsal aspect of the penis, sends branches to the corpus cavernosum, and its terminal branches enter the glans penis, where they anastomose with the arteries to the bulb. It also anastomoses with the external pudic branches of the femoral.

The *nerve supply* of the bulbo cavernosus is from the perineal branches of the pudic nerve and its purpose to compress the bulb and corpus spongiosum and to assist in expelling the fluid contained in the urethra. The muscular fibers which pass to the dorsum of the penis or clitoris may aid slightly in their erection either directly or by compressing the dorsal vein.

The integument of the root of the penis is supplied by the ilio-inguinal and inferior pudendal nerves and the body and prepuce by the branches of the dorsal nerves. Branches of the pudic supply the bulbus urethra and mucous membrane of the urethra and each corpus cavernosus by a deep branch from the dorsal nerve.

Perineal branches of the pudic, ilio inguinal, and sympathetic nerves from the hypogastric plexus control the erection of the penis and clitoris.

Lymphatics of the Glans Penis.—The collecting trunks of the glands arise from a fine network which partly drains the network of the prepuce and the balanitic portion of the urethra. These collecting trunks are two or three in number. The exact point of origin is at the frenum, since a series of finer collecting trunks drain and converge at this point. Two or three trunks which drain the mucous membrane of the urethra also empty into the main collecting trunks. The course of the main collecting trunks is around the corona of the glands and from two to four collecting trunks and anastomose with those of the opposite side, which run parallel with the dorsal vein of the penis, and terminate in the pre-symphysical at the penile root.

The cutaneous lymphatics of the penis are divided into two sets the lymphatics of the sheath, and the lymphatics of the prepuce.

Lymphatics of the sheath have four or five collecting trunks. They differ in length. Those most anterior are longer. These collecting trunks take their origin from the dense lymphatic network of the prepuce. The collecting trunks pass around the lateral surface of the penis to the dorsal surface; after which they pass to the penile root, where they make a sharp turn outwards to the inguinal glands.

Lymphatics of the prepuce originate from the fine network in the plicature of the skin of the preputial fold. They are also continuous from the lymphatics of the glands in the balanitic portion. The collecting trunks vary in number from one to two, to a multiplicity of collecting trunks.

Their course is along the dorsum of the penis, near the superficial dorsal vein. When more than one trunk exists they give off anastomosing branches along their course, at the penile root. If only one trunk is present it may divide into two trunks, which are equal in size or it may continue without division to its limitation which is an inguinal gland. When several trunks exist they form two at the penile root. They usually terminate in the supero-internal group. Yet, however, they may also terminate in other glandular groups of this region. The collecting trunks are located just beneath the integument.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Male Erectile Body.

Anomalies.
Diseases } Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies of the erectile bodies may be congenital or acquired, primary or secondary, vary in position and relation to other tissues, the blood, nerve, and lymph supply more or less than normal and any one or more of its structures, wanting in part or their entirety.

Shape may be regular or irregular, smooth or nodulated, curve upward, downward, to either side, taper excessively from the proximal or distal end.

Blind Pouches may be congenital or acquired, single or multiple, vary in size, shape and location and contain mucus or serum.

Shape may be excessively long or short, diameter vary greatly from end to end, single or multiple, position to the right or left of the median line, high or low, concealed in part or its entirety, within the scrotum, perineum, groin or upper thigh.

DISEASES.

Benign. Malignant.

BENIGN.

Ulcers may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, due to trauma or infection in any tissue or portion of the erectile body, continue, cease to grow or disappear spontaneously.

Syphilis may be congenital or acquired, acute or chronic, primary or secondary, in the form of chancre, chancroid, gumma, single or multiple, vary in size, shape and location.

Tuberculosis may be acute or chronic, primary or secondary, single or multiple, vary in size, shape or location in any tissue.

Fibromata may be congenital or acquired, single or multiple, primary or secondary, in any portion of the gland, originate in any tissue and extend into the adjacent structures.

Lipomata may be congenital or acquired, single or multiple, primary or secondary, round, oblong, smooth or lobulated in any of the fatty structures, vary in size, remain dormant, increase or diminish in size or disappear spontaneously.

Adenomata may be congenital or acquired, primary or secondary, single or multiple, vary in shape, location, usually without pedicle, and in any tissue.

Concretions may be congenital or acquired, primary or secondary, single or multiple, soft or hard, usually between the gland and prepuce, vary in size, shape, and number in the body.

Bony deposits may be congenital or acquired, primary or secondary, single or multiple, hard or soft, vary in shape, size and location, involve a part or all of the organ, the walrus, raccoon, many monkeys, dog and many members of the negro race being examples.

Horny growths may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and location, continue or cease to grow, or disappear spontaneously.

Lymphangitis may be congenital or acquired, primary or secondary, acute or chronic, mild or severe.

Lupus may be primary or secondary, vary in shape, size and position.

Gangrene may be mild or severe, in any portion, with partial or complete loss of the organ, always acute.

Elephantiasis may be congenital or acquired, primary or secondary, acute or chronic, from slight to enormous in size, usually general.

Cysts may be congenital or acquired, single or multiple, primary or secondary, contain blood, pus, mucus or serum, originate in any of the structures, especially externally, rupture into the rectum, urethra, bladder, perineum, scrotum, vagina, uterus or peritoneal cavity.

Fistulae may be congenital or acquired, single or multiple, primary or secondary, extend from the urethral canal through the cutaneous structures, connect with the rectum, vagina, bladder, peritoneal or uterine cavities or through the perineal body, several channels existing at the same time.

Phimosis may be congenital or acquired, primary or secondary, acute or chronic, partial or complete, with or without adhesions.

Paraphimosis may be congenital or acquired, primary or secondary, acute or chronic.

MALIGNANT.

Carcinomata may be primary or secondary, usually primary, and single, in any tissue, especially the prepuce corona or distal end of the gland.

Sarcomata may be primary or secondary, in any tissue and portion of the gland.

INJURIES.

Ruptures, lacerations, punctures, incisions and contusions may be the result of accident or design, penetrating or non-pentrating, primary or secondary, smooth or irregular, longitudinal or circular, in any portion of the body.

Fractures may be congenital or acquired, usually acquired, single or multiple, by accident or design, complete or incomplete, in any portion of the body.

Dislocations may be congenital or acquired, forward, backward or to either side.

SYMPTOMS.

Symptoms pertaining to the *erectile body* in the male and female are very similar physiologically, tenderness, pain and general nervous disturbances being most prominent.

Pain of any degree may be acute or chronic, primary or secondary, and sometimes due to conditions far distant to the erectile body. Adhesions and furuncles about the clitoris are not uncommon causes, but any disease or irritation may cause erection of this body, or it may be purely psychical, with or without frequent desire to urinate and the amount of urine increased.

Cardio-vascular disturbances resulting from abnormal conditions of the male reproductive organs are more or less in evidence, especially with infections and advanced prostatic conditions. Those affecting the erectile body, testes, spermatic ducts and scrotum being not so highly manifested.

Vascular symptoms of the male *erectile body* are induced by severe and prolonged pain, the pulse-rate varying from slow to rapid as the result of these causes but the rate and quality may change from time to time without any perceptible irregularity in the organ.

Urinary disturbances are always present with any pathology or trauma that may exist in the *erectile body* of the male. The amount of urine may be greatly increased or diminished and contain blood, pus, concretions or necrotic tissue and cause severe burning or tenesmus, or it may escape through one or more of the many forms of artificial openings.

CHAPTER XIV.

PROSTATE GLAND.
ANATOMY.

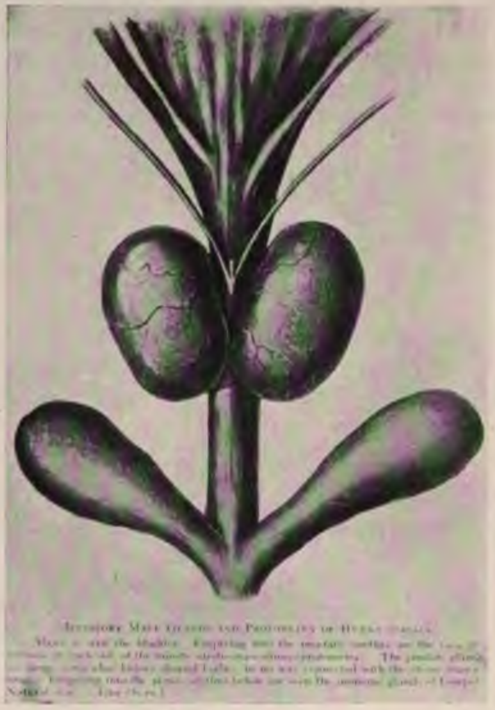


Fig. 48.

THE PROSTATE GLAND normally is composed of two lateral and a middle lobe, the three combined being about the size and shape of a large horse chestnut, in the adult, and weighs about $\frac{1}{2}$ ounce. The middle lobe which is about the size of a pea is frequently absent while the lateral lobes vary in shape and size, one of which may be also absent. The three lobes are enclosed in a thin, firm, fibrous, capsule and the urethra and seminal ducts pass through the gland but often vary in their course. The two small yellow bodies about the size of a pea which lie beneath the anterior part of the membranous urethra close behind the bulb and are enclosed in the transverse fibers of the compressor urethra muscle, were discovered by Cowper for whom they are named. The prostate gland is composed of many follicles and muscular fibers in such a number as to form fifteen to twenty channels designated as secretary ducts lined with columnar epithelian and open into the prostatic urethra.

The prostatic muscle is supported upon the anterior wall of the bladder by fibers of the levator ani, which are also called levators of the prostate on the sides.

Leuckhart states that in women there exists a true rudimentary prostate, consisting principally of mucous follicles and situated between the beginning of the urethra and the reflection of the vagina. Hodgson also states that Virchow admitted the existence of this body, found at the neck of the bladder, especially in old women.

Most observers have held that the glandular portion of the prostate originates from the urethra and the stroma of the organ develops from a thickening of the genital chord, but Griffiths and Richardson who have made a detailed study of this gland say that no part is developed from the genital chord.

The *blood supply* is from the middle hemorrhoidal, inferior vesical and internal pudic artery while a large venous plexus surrounds it. Into this plexus veins of the penis open and communicate with the vesical plexus and drain into the iliac veins. These veins which become larger with advanced age, besides draining the dorsal veins, also drain those of the bladder, seminal vesicles and the rectum, and are continued as the prostatic vesical plexus, tributary to internal iliac veins.

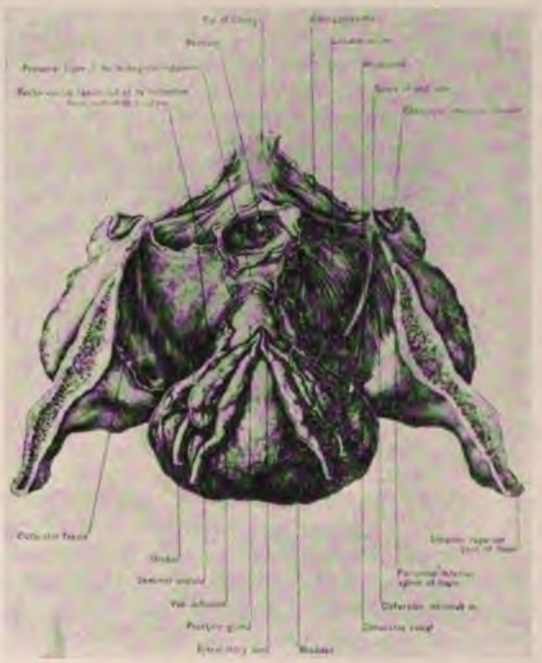


Fig. 49.—Bladder, prostate, seminal vesicles, vasa deferentia (Deaver).

Nerve supply is from the hypogastric plexus in the form of sympathetic fibers associated with small ganglia along their course. Pacinian corpuscles are said to be connected with the sensory fibers (Piersol).

Lymphatics of the prostate arise by fine capillaries arranged in the form of a network around each glandular acinus. From these periacinous networks, run larger vessels which pass towards the periphery of the gland, and form at its surface a second network, the peri-prostatic network, from which the collectors start. The latter which are symmetrically arranged on each side of the gland, may run in four different directions.

A primary trunk starts from the posterior surface of the prostate, and runs on to the bladder in the triangle between the vasa deferentia. It ascends as far as the middle part of the postero-superior surface of the bladder, where it curves sharply outward, across the hypogastric artery, and terminates in the middle gland of the middle chain of the external iliac group. In its retro-vesical course, this trunk describes numerous curves; it may pass through some small interrupting glandular nodules (*Schaltdrüsen*) close to the spot where it crosses the hypogastric artery. This ascending channel frequently consists of two trunks which then terminate in the middle and superior glands of the middle chain.

A second collector arising like the preceding from the posterior surface of the prostate, accompanies the prostatic artery. Like the latter, it runs upwards, outwards and backwards, and terminates in one of the middle glands of the hypogastric group. In the neighborhood of the prostatic origin of this trunk, two or three small glandular nodules are almost constantly found.

Two or three other collecting trunks also start from the posterior surface of the gland, and run at first downwards, and then backwards. They enter the sacro-recto-genital aponeurosis, cross the lateral surface of the rectum, and then ascend on the anterior surface of the sacrum. They do not all terminate in the same manner. The shorter and more external end in the lateral sacral glands, which as we have already seen, are usually situated internal to the second sacral foramen, the longer and more internal pass as far as the promontory to terminate in the glands situated there.

Finally, from the anterior surface of the prostate may be seen a descending trunk which runs towards the pelvic floor, where it unites with the vessels coming from the membranous portion of the urethra. In company with the latter, it embraces the artery of the corpus spongiosum, and then runs with the internal pudic; it finally terminates in a gland of the hypogastric group, situated on the intrapelvic portion of the trunk of the internal pudic artery. The descending prostatic channel, which was observed in the dog by Walker, has also been found in man by Marcille (three times in fifteen subjects).

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases. { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, single or multiple, primary or secondary, vary in shape, number, position, size and relation to other tissues, or none at all but doubt exists about the total absence of prostatic tissue.

DISEASES.

Benign. Malignant.

BENIGN.

Adenomata may be congenital or acquired, single or multiple, primary or secondary, usually primary, in any portion of one or more glands, vary in size, shape, location, cease to grow, continue to increase in size, disappear spontaneously, undergo cystic or malignant changes.

Papillomata may be congenital or acquired, single or multiple, primary or secondary, usually primary, in any portion of one or more glands, vary in size, shape, location, cease

CHAPTER XV.

COWPER'S GLANDS.

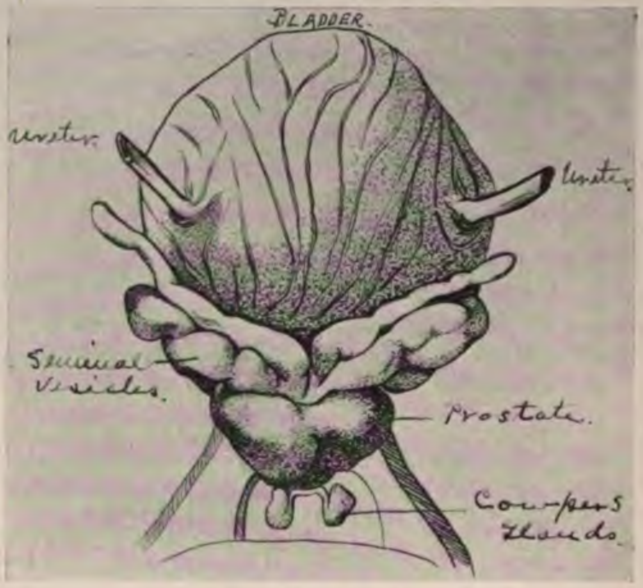


Fig. 50. (Ayers.)

COWPER'S GLANDS are situated between the two layers of the triangular ligament, anteriorly to the prostate gland. Normally there are two in number, but there may be only one. Discovered 1696.

They are ovoid in shape just beneath the membraneous portion of the urethra, close to the mid-line on each side. They are the size of an ordinary pea, irregular and somewhat knobbed in shape. They are of a pinkish hue, firm imbedded in the fibers of the compressor urethra muscle. The ducts are 1.5 mm. in diameter, 3.4 mm. in length. They open by small slit-like orifices on the lower wall of the bulbus urethra near the mid line. The ducts sometimes open into the urethra by a common orifice. They are homologous with the Bartholin glands in the female and are accessory organs.

The blood supply are twigs from the arteries of the bulk, and the veins are tributary to those returning the blood from the bulbus spongiosum, which empty into the internal pudic.

The lymphatic are afferents to the internal iliac lymph nodes.

Besides anomalies (which is probably of little importance), the various forms of disease and growths may be found involving these glands. If so, they must play a

CHAPTER XVI.

TESTICLES.

ANATOMY.

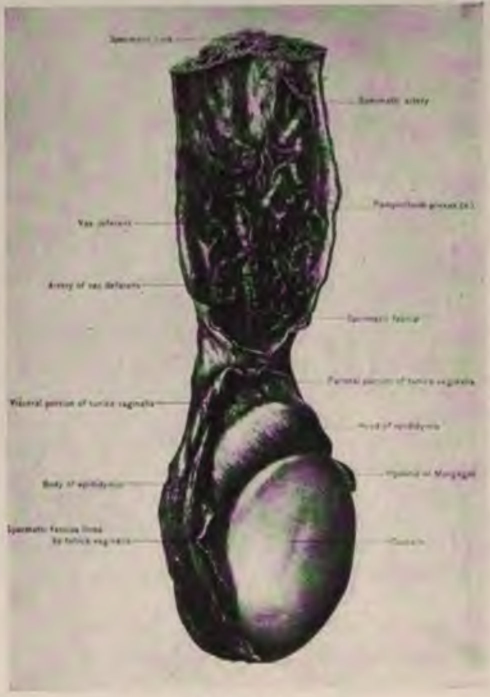


Fig. 51. (Deaver.)

THE TESTES are two glandular organs which secrete the semen. They are slightly compressed ellipsoidal bodies, suspended in the scrotum by the spermatic cord, the left lower than the right. They each measure about 4½ cm. in length, 2½ cm. in width and 2 cm. in thickness.

In early foetal life they are in the abdomen, post-peritoneal. Before birth they descend into the scrotum through the inguinal canal, carrying along the various layers, nerves, blood vessels, etc.

The framework proper consists of a stout capsule, the *tunica albuginea*, which gives form to the organ and protects the subjacent glandular tissue.

From the greatly thickened posterior portion of the tunica albuginea, numerous septa arise which pass forward and divide the organ into separate compartments (or lobules) each of which contains from one to three greatly convoluted seminiferous tubules held together by delicate vascular, intertubular connective tissue.

primary form, confined to the gland or glands, or extend into their surrounding soft structures.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, involve one or both glands, continue in its destruction, remain stationary, disappear spontaneously or involve the overlying soft structures.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, and involve either one or both glands, in any tissue.

Lipomata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, location and extend into the surrounding structures.

Retraction may be congenital or acquired, primary or secondary, partial or complete, temporary or permanent, unilateral or bilateral.

Hemorrhagic infarct may be congenital or acquired, primary or secondary, usually acute, vary in size, location and severity.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, in one or both glands, originate in the cortex, the ducts, connect with the peritoneal cavity into which they may discharge, rupture through the external and cutaneous structures, seldom if ever into the urethra, occasionally into the rectum, more frequently into the perineum, contain blood, pus, serum, dermoid material, or echinococci, one or more simultaneously.

Fistulae may be congenital or acquired, primary or secondary, single or multiple, connect with the peritoneal cavity, urethra, rectum or perineum, one or all, at the same time, become closed spontaneously, remain indefinitely, vary in size or course or rupture through the soft structures.

MALIGNANT.

Carcinomata may be primary or secondary, usually epitheliomatous and vary in size, shape and number.

Sarcomata may be primary or secondary, vary in location, and in any tissue.

INJURIES.

Foreign bodies invariably enter the gland through the overlying soft structures. They may be single or multiple, vary in size, location and character, become encysted, remain permanently, escape into the scrotum where they may remain, or through which they may afterward escape.

Ruptures, punctures, lacerations, incisions, and contusions may be the result of accident or design, primary or secondary, single or multiple, involve any portion of one or both glands to the degree of functional disturbance or destruction.

SYMPTOMS.

Symptoms associated with *testicular* variations are simple in character, therefore easy to determine when compared to the deeper structures and organs of the perineum.

Pain is not always confined to these glands because of their inhibition being by branches of the pudic which supplies so generally the perineum.

The milder forms of testicular conditions usually produce local symptoms, while the more aggravated forms cause both local and general symptoms, severe in character because all of the reproductive and urinary organs are likewise disturbed, especially with the acute form of disease.

Epididymis. The greatly convoluted beginning of the seminal ducts, covers the entire posterior border and outer surface of the testis.

Blood Supply. Principally the deferential vessels, the spermatic and the cremasteric arteries.

Nerve Supply. Spermatic and deferential plexuses which surround the corresponding arteries.

Vas Deferens. This tube extends from the epididymis to the ejaculatory duct and includes almost the entire length of the spermatic duct.

The ejaculatory duct is formed by the union of the ducts of the corresponding seminal vesicles and vas deferens, and empties into the urethra.

Blood supply of spermatic ducts is chiefly the deferential from the internal iliac. It also receives a branch from the middle hemorrhoidal.

Lymphatics of the Vas Deferens. The origin of the collecting trunks of the deferens is supposed to be from two net works, viz.: the muscular and mucous. Some doubt, however, exists since the latter has never been injected. These collecting trunks terminate in external retro-crural gland and in the middle chain of the external iliac glands.

Lymphatics of the seminal vesicles arise from a network, which is formed by the anastomosis of two networks. One originates in the mucous coat, while the other takes its origin in the muscular coat.

There are Two Collecting Channels. They anastomose with those of the urinary bladder, and also vary much from those from the prostate. A posterior gland of the external iliac group, and a hypogastric gland are the terminals.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, single or multiple, primary or secondary, partially or completely absent, long, short, large, small, sacculated, patulous, partially or completely closed, for a short or long period, or they may never become patulous.

DISEASES.

Benign. Malignant.

BENIGN.

Inflammation may be primary or secondary, acute or chronic, involve a part or all of the duct.

Tuberculosis may be acute or chronic, primary or secondary, single or multiple in any portion, cease, or continue to develop, disappear spontaneously, or become permanently destroyed.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, involve any portion, continue to develop or disappear spontaneously.

Cysts may be congenital or acquired, acute or chronic, primary or secondary, single or multiple, gradually or suddenly disappear by draining into the urethra or rupturing into the surrounding soft structures to become absorbed, or through them, externally upon the skin, into the perineum, scrotum, rectum, bladder or peritoneal cavity.

CHAPTER XVIII.

SCROTUM.

ANATOMY.

THE SCROTUM, sac-like in appearance, is composed of muscular fibers known as the dartos muscle, situated in the superficial fascia and skin, containing sweat and sebaceous glands with their ducts and areolar tissue, in all of which there is an absence of fat. The tissue within the median line known as the raphe is more dense and capable of contraction.

Blood supply is from the superficial perineal branches of the internal pudic arteries from behind and the external putic branches of the femoral artery above and in front.

Nerves.

The scrotum in the male and labia in the female are supplied with nerves (Deaver) from the lumbar plexus, which go to the front and sides of the scrotum including cutaneous from the genital branch of the genito-crural nerve usually reinforced by branches from the ilio-inguinal that end in the skin in the vicinity of the root of the scrotum, and the sacral plexus which supplies the posterior surface of the scrotum and are from the perineal or inferior pudendal branches of the small sciatic nerves, and the anterior or external superficial perineal branches of the pudic nerves, sympathetic fibers accompanying the cutaneous nerves for the dartos muscle. Deaver also states that scrotal and labial pain may be due to pressure upon the trunk of the inferior pudendal nerve, the small sciatic or that portion of the sacral plexus or spinal cord from which the filaments arise; while on the other hand, pressure upon the terminal part of the inferior pudendal may give rise to pain referred to the back of the thigh.

External Lymphatics in the Male.

Collecting trunks of the scrotum are divided into the superior, and inferior. There are ten or fifteen trunks on each side which form a dense network.

Superior collecting trunks originate on that part of the scrotum which is a continuation of the penile raphe. They pass upward in a vertical direction to the root of the penis, where they turn obliquely outwards, running parallel with the collecting trunks of the penis. After they cross the spermatic cord they terminate in the supero-internal superficial inguinal glands.

Inferior collecting trunks originate below and posterior to the superior collecting trunks. They pass to the lateral parts of the scrotum in an upward and outward direction to the lateral part of the scrotum, from whence they enter and follow the cruro-scrotal groove for a brief distance, and then pass outwards, terminating in the inferior internal glands.

Within the pre-symphysical plexus are several glandular nodules. This plexus is drained by a number of collecting trunks, which pass into the inguinal and crural canals.

One inguinal collecting trunk passes into the spermatic cord, and terminates in the external retro-crural gland, as the inguinal collecting trunk enters the inguinal canal, it usually gives off a small glandular nodule.

MALIGNANT.

Carcinomata may be primary or secondary, vary in size, shape and location and be in any of the structures usually within the skin.

Sarcomata less frequent, primary or secondary, vary in size, shape and location and originate in any of the structures.

INJURIES.

Lacerations, punctures, incisions, and contusions are the result of accident or design, primary or secondary, vary in number, degree and location, sharp or ragged in any tissue or location.

SYMPTOMS.

Symptoms scrotal in character are pain, tenderness and induration, mild or severe, local or general or both, but pain and tenderness may exist in scrotal structures free from disease or injury, because of their richness in sensitive nerve fibers and intimate relation with other structures equally well supplied.

Each of these symptoms may be primary or secondary to conditions within the structures contained within the sac or tissues far distant to it, especially the prostate, urethra, bladder or rectum.

CHAPTER XIX.

VAGINA.

ANATOMY.

THE VAGINA originally the cloacal chamber, contains the clitoris, external urinary meatus and the cervix uteri with its opening surrounded by mucous membrane, deeply folded to form the major and minor labiæ which form its outlet.

The bulbo cavernosus in the female has been termed the sphincter vaginæ, the two muscles of opposite sides are widely separated from each other by the vagina which they surround. They arise from the central tendon of the perineum, pass forward investing the bulbi vestibule and are lost in the fascia covering the corpora cavernosa and the dorsal surface of the clitoris.

Vaginal mucous membrane has a stratified scaly epithelium and is corrugated by a number of transverse ridges called rugæ vaginales. There is also a transverse rugæ on the anterior and posterior wall of the vagina especially seen in young subjects in the lower part of the vagina. Within the mucous coat, nodules of lymphoid tissue are found, and the vaginal wall is surrounded by loose vascular connective tissue, containing many large communicating veins.

The blood supply is mostly from the branches of the vesico-vaginal artery, vaginal branch of the uterine artery, vaginal branches of the middle hemorrhoidal and internal pudic arteries.

The veins surrounding the vaginal wall drain their contents into the internal iliac vein.

Nerves supplying the vagina, according to Piersol, are from the hypogastric sympathetic plexus through the pelvis and from the second, third and fourth sacral nerves. The immediate source of the sympathetic fibers is from the cervical ganglia at the side of the neck of the uterus from which in association with the sacral branches, twigs pass to and from each side of the vaginal plexus that embraces the vagina and filaments chiefly for the involuntary muscle of its walls and blood vessels. Sensory fibers are few in the vaginal mucous membrane so that the upper vagina has but slight sensibility though it is greatly increased as the vaginal orifice is approached by the pudic fibers which supply the mucous membrane and which send motor fibers to the striated muscle surrounding the entrance.

Lymphatics of the Female. The female sexual organs are external and internal, and have their corresponding lymphatics. Therefore, the lymphatics of the external and internal genitalia are considered separately. The lymphatics of the vulva arise from a network which is arranged in several planes and which covers the forchette, meatus urinarius vestibule, labia minora, labia majora and clitoris. Drainage of this meshwork is accompanied by collecting trunks which take an upward and forward direction to the mons veneris where they change abruptly into a transverse direction towards the superficial inguinal glands. The collecting trunks arising from the posterior two-thirds, take an upward and outward direction before reaching their terminal glands. The termination of the vulva glands is the superior-internal group, inferior-internal group or one of the external groups. They usually, however, terminate in the former group, rarely in the latter group.

Lymphatics of the Vagina. Two kinds of tissue are drained by the vaginal lymphatics: mucous membrane and muscular respectively.

Those which drain the mucous membrane are beneath the epithelium, and are composed of a very fine and dense network. The muscular lymphatics are the coarser of the two.

The collecting trunks of the vaginal lymphatics are divided into three groups, viz.: the superior, middle and inferior group.

The superior group drains the upper third of the vagina. Two collecting trunks arise from this group. One arises anterior to the cervix, while the other arises posterior to the cervix.

The anterior collecting trunk, after passing upward, outward and anterior to the ureter, receives several cervical trunks and terminates in the middle gland of the middle chain of the external iliac group.

The posterior collecting trunk takes an upward and outward direction and terminates either in the middle gland of the middle chain of the external iliac group, or in the posterior gland of this group.

The middle group drains the middle third of the vagina. Its direction is upward, backward and outward, and corresponds to the direction taken by the vaginal artery. The termination is a gland of the hypogastric group, which is located in the hypogastric space at the origin of the vaginal artery.

The inferior group collecting trunks arise in the third of the recto-vaginal septum.

First.—These collecting trunks descend, then pass outward and backward, after which they pass upward into the cavity of the sacrum, internal to the sacral foramen and terminate usually in the glands of the promontory group. Occasionally they terminate in the lateral sacral glands.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

Anomalies. A part or all of the vaginal tissues may be absent. The cavity large or small, irregular in shape, entirely absent. septinated, deep, shallow or narrow and have one or more external or internal openings, those internal entering the rectum, bladder or peritoneal cavity.

DISEASES.

Benign. Malignant.

BENIGN.

Vaginitis may be primary or secondary, acute or chronic, mild or severe and involve a part or all of the vaginal mucosa.

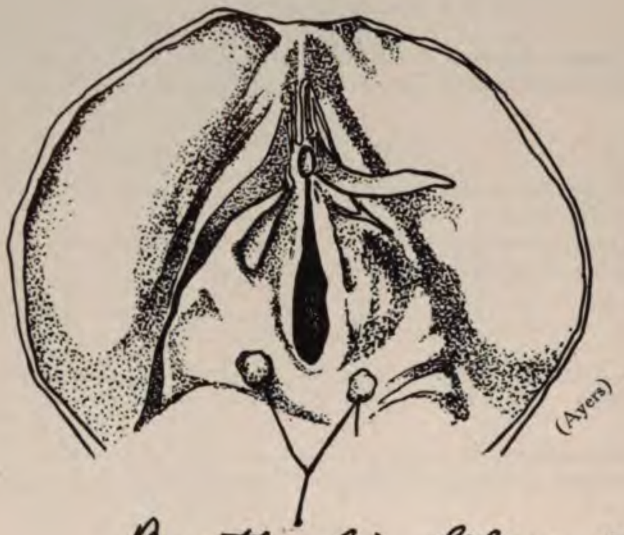
Ulcers may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, vary in size, shape and depth, in any tissue or portion of the vaginal wall, cease, continue to grow, or disappear spontaneously.

Papillomata may be congenital or acquired, single or multiple, primary or secondary, in any portion of the mucous membrane, especially upon the muco-cutaneous border, vary in size and shape, usually pedunculated, cease, continue to grow or disappear spontaneously.

CHAPTER XX.

BARTHOLIN GLANDS.

ANATOMY.



Bartholin Glands.

Fig. 53.

BARTHOLIN GLANDS in the female are the homologues of Cowper's glands in the male. They are a small pair of organs situated one on either side of the vaginal orifice, behind the bulbus vestibuli and about the middle of the base of labium major. The duct merges from the anteromedial border of the gland. It is a small tube about 2 mm. in diameter and about ½ cm. long, and opens into the vaginal orifice between the nymphæ and the hymen.

Its structure corresponds to the mucous tubo-alveolar type, the small component lobules however, being separated by fibromuscular tissue, the terminal compartments are lined by columnar epithelium and contain numerous goblet cells.

The main duct sometimes has ampulary enlargements. The secretion of the gland is whitish in color and viscid.

Blood Supply. The arteries supplying this gland are twigs given off from the bulbar branch of the internal pudic. The veins are tributaries chiefly to the internal pudic but also communicate to the trunks of the vestibular bulb and the vagina.

Nerves are very numerous and include sympathetic fibers and twigs from the pudic.

Lymphatics. The lymphatics join those of the vagina and rectum that are afferents of the internal iliac nodes.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies. The glands of the two sides often vary in size and may be asymmetrically placed. The ducts may be double and the lobules so separated that the usual gland mass is replaced by isolated divisions or sometimes seemingly wanting on one or both sides.

DISEASES.

Benign. Malignant.

BENIGN.

Inflammation may be primary or secondary, acute or chronic, unilateral or bilateral and vary in degree.

Papillomata may be congenital or acquired, primary or secondary, vary in size, number, shape and location.

Adenomata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Fibromata may be congenital or acquired, primary or secondary, vary in size, shape, number and location.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, contain blood, pus, or serum, vary in size, shape, number and location, rupture through the cutaneous structures, their natural course, into the vagina or rectum.

Fistulæ may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size, shape, length, open through the skin into the vagina or rectum.

MALIGNANT.

Carcinomata may be primary or secondary, vary in size, character, shape, location and rate of growth.

Sarcomata may be primary or secondary, vary in size, shape, character, location and rate of growth.

INJURIES.

Incisions, punctures, contusions may be accidental or induced, primary or secondary, vary in degree and severity.

SYMPTOMS.

Symptoms such as pain, tenderness, redness and induration are most prominent. They may vary in degree and severity, local or general in their manifestations, and when general, are difficult to recognize.

CHAPTER XXI.

CLITORIS.

ANATOMY.

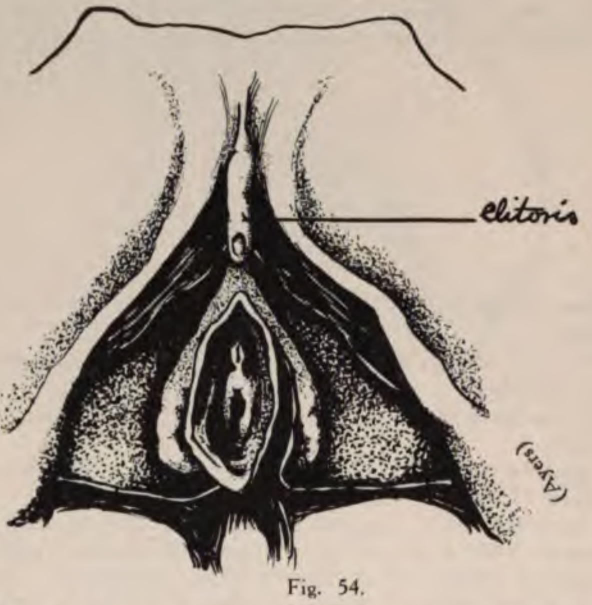


Fig. 54.

THE ERECTILE BODY (clitoris in the female), is the analogue of the penis in the male and is therefore to be considered much in the same manner symptomatically. It is buried in such a manner beneath the labia that only its small conical anterior end and the lower vertical ridge of integument over the body appear when the labiæ are separated.

Blood Supply. The vessels supplying blood to the clitoris correspond with those of the penis but are smaller and the same arrangement is found with the veins.

Nerve supply in its derivation and distribution is the same as found in the penis, being from the sympathetic system for the walls of the blood spaces and from the pudic nerves. The dorsal nerve is relatively larger and supplies the integument of the glans and prepuce with fibers connected with special sensory end organs (Piersol).

Clitoris. The lymphatic glands of the prepuce terminate in the superficial inguinal glands. Those of the glands clitoris resemble the lymphatics in the male. Their origin is composed of a network which empties into several collecting trunks. They pass along the dorsum of the clitoris to a point anterior to the symphysis, where in their union the pre-

CHAPTER XXII.

UTERUS.

ANATOMY.

THE UTERUS constitutes in weight a larger amount than all of the other reproductive organs in the female, and because of this it is probably more frequently the seat of pathology, especially with the addition of pregnant conditions. It must, therefore, play a prominent role in symptomatology.

Blood supply is from the two uterine, each a branch of the internal iliac that accompanies the ureter along the pelvic wall, behind and below the ovarian fossa, to the attached border of the broad ligament beneath which it passes in its course to the ureters.

As it is not necessary to describe in further detail the blood supply of this organ the subject will be concluded by reference to its intimate blood relation to the entire uro-genital and rectal tracts. (See Piersol, pp. 2009-2010.)

Uterine nerves are large and for involuntary muscles and derived from the sympathetic system, the (utero-vaginal subdivisional) of the pelvic plexus, but directly from the second, third and fourth sacral spinal nerves.

The utero-vaginal plexus divide into two parts, the smaller for the posterior, and the lateral parts of the uterus. The larger consists of a chain of small ganglia along the cervix and vaginal vault.

Sympathetic nerves supply involuntary muscular walls of the uterus and tubes so that irritation from the generative organs travels to the abdominal brain by way of the ovarian and hypogastric plexuses. Uterine and tubal neuralgia is thus explained. Laceration of the cervix pathologic in character for five years has been described by Sutton as being the cause of confirmed neurasthenia.

Lymphatics of the Uterus. The uterine lymphatics originate in the mucous muscular and peritoneal coasts respectively. A network is formed by their anastomosis in the sub-peritoneal cellular tissue. The collecting trunks number four or five. The networks which originate at the cervix or corpus uteri are continuous, yet the cervical or corporal collecting trunks are considered separately.

Cervical collecting trunks number from four to eight. They form the large lymphatic knot after leaving the cervix. This knot is called the juxta-cervical knot, it is often absent in the new-born, but always present when pregnancy exists. The cervical collecting trunks are subdivided into three groups, viz.: primary, secondary and lateral sacral groups.

Primary Groups. There are two or three collecting trunks in the primary group, they converge towards the lateral portions of the corpus-uteri. They usually pass upward and anterior to and above the ureter. Occasionally their course is posterior and sub-ureteral. After accompanying the uterine artery for a short distance, the lymphatics leave the uterine artery and pass up the lateral wall of the pelvic cavity internal to the hypogastric artery in the adult, cross it in the foetus. They terminate in the middle and superior gland of the middle chain of the external iliac group.

The juxta-cervical gland was first discovered by M. Lucas Championniere. It is occasionally found as an interrupting glandular nodule by the side of the cervix. Reynier pedunculated, hard or soft, vary in shape or size, in any portion of the uterine wall, attached to any of the abdominal viscera or abdominal wall, become cystic, rupture into the uterine or peritoneal cavity, rectum, vagina or bladder.

Papillomata may be congenital or acquired, primary or secondary, single or multiple, vary in size or shape, with or without pedicle, anywhere upon the external or internal surfaces.

Adenomata may be congenital or acquired, primary or secondary, single or multiple, vary in size and shape, with or without pedicle (usually without), anywhere upon the external or internal surface.

Pregnancies may be normal or abnormal, single or multiple, become attached anywhere upon the mucous surfaces or upper cervical canal, escape through the cervical canal, uterine wall into the rectum, intestinal canal, bladder, peritoneal cavity, life of the foetus become extinct during any period of development, and the body remain indefinitely within the uterine cavity.

Procidentia may be congenital or acquired, primary or secondary, vary in degree from slight to complete, return spontaneously to the normal position where it may remain indefinitely, or descend to any degree at any age and remain without ever having been impregnated.

Cysts may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, contain blood, pus, serum, urine, feces, echinococci, dermoid or colloid material, rupture into the uterus, bladder, rectum, peritoneal cavity, intestinal canal or externally through the skin or perineum.

Fistulæ may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, enter the bladder, uterus, rectum, peritoneal cavity, intestinal canal, perineum or pass through the external cutaneous structures.

MALIGNANT.

Carcinomata may be primary or secondary, single or multiple, in any tissues of the uterine body, especially the cervix.

Sarcomata may be primary or secondary, single or multiple, hard or soft, in any of the tissues of the uterine body.

INJURIES.

Lacerations, punctures, and ruptures may be complete or incomplete, the result of accident or design, from within or without, single or multiple, longitudional or circular, penetrate into the peritoneal cavity, bladder, vagina, rectum, the overlying soft structures, or indirectly into the intestinal canal, blood vessels, ureters or Fallopian tubes.

Foreign bodies may be by accident or design, single or multiple, vary in character, enter through the vaginal and cervical canals, bladder, rectum, or peritoneal cavity, the overlying soft structures or make their exit through these structures.

SYMPTOMS.

Symptoms ascribed to the *uterus* highly dominate the adjacent organs and soft structures because of richness in sensory nerve fibers from the pudic and their coalescence with sensory fibers from the same source.

The same group of symptoms are manifested with all and probably to the same degree throughout their existence whether they be mild or severe.

This organ normally being the largest of the perineal and pelvic structures, and varying so greatly in size during pregnancy and disease, and possessing such a great blood, lymphatic and nerve supply, places it first in variety of pathology and symptomatology. It must also be the greatest factor in their complications.

Local manifestations such as pain and tenderness are most prominent and may be more readily defined than other pelvic organs when involved without the manifestations of chill, headache, shock, perspiration, nausea and vomiting.

The various forms of uterine pregnancies are without doubt the more common exciting causes of these manifestations. Next in frequency are accidents incident to pregnancy, but uterine pathology of any kind may cause similar manifestations.

The blood is returned by communicating veins similar to the pampiniform plexus in the male.

Nerves are from a plexus which accompanies the ovarian artery and which is continuous above with the renal plexus. Other fibers are derived from the lower part of the aortic plexus and join the plexus on the ovarian artery. The afferent impulses from the ovary reach the central nervous system through the posterior root fibers of the tenth thoracic nerve.

Ovarian lymphatics form a dense plexus, which when infected overshadows the subjacent venous plexus. After the plexus becomes smaller, four to six collecting trunks are formed. They take an upward course with the ovarian vessels, pass anteriorly to the common iliac vessels and ureter accompanying and then anastomose with lymphatics from the Fallopian tube and uterine fundus at the fifth lumbar vertebra, after which they terminate in the lateral aortic glands. One vessel passes downward and slightly outward into the superior part of the ligament and terminates in one gland of the middle chain of the internal iliac group. Marcille, Zeissl and Horowitz have one of the testicular lymphatics end in the same gland of the abdomino-aortic group.

ETIOLOGY.

Anomalies, Diseases and Injuries.

- Anomalies.
- Diseases
  - Benign.
  - Malignant.
- Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, in form, size, shape and position. When single they are invariably of horse-shoe shape.

DISEASES.

Benign. Malignant.

BENIGN.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and location.

Papillomata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and location, with or without pedicles and disappear spontaneously, though this is a rare occurrence.

Adenomata may be congenital or acquired, primary or secondary, vary in size, shape, number and location, with or without pedicles, usually without, and seldom disappear spontaneously.

Pregnancies of the ovaries are of rare occurrence, with considerable doubt as to the possibility of multiple ovarian pregnancies. They may mature without rupture, become encysted and remain indefinitely, or rupture at any period during development into the peritoneal or intestinal cavity, bladder, uterus, rectum or vagina.

Adhesions may be congenital or acquired, primary or secondary, single or multiple, with or without disease, to the uterus, Fallopian tubes, bladder, intestines, appendix, rectal or vaginal wall.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, contain blood, pus, serum, echinococci, fecal, colloid or dermoid material, rupture into the peritoneal cavity, Fallopian tube, uterus, bladder, intestinal tract, rectum or vagina.

Herniæ of the ovaries may be congenital or acquired, primary or secondary, unilateral or bilateral, through the femoral or inguinal ring, into the labia, bladder, rectum or vagina.

Fistulæ may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, open into the peritoneal cavity, Fallopian tube, uterus, bladder, intestinal canal, rectum, vagina or perineum.

MALIGNANT.

Carcinomata may be primary or secondary, usually primary, involving one or both ovaries, rarely both, in any portion of the gland and extend into the surrounding structures.

Sarcomata may be primary or secondary, usually primary, involve one or both ovaries and extend into the ovarian ligament first, broad ligament tube, uterus and surrounding soft structures like carcinoma.

INJURIES.

Ruptures, incisions, punctures and lacerations may be by accident or design, primary or secondary, single or multiple, penetrating or non-penetrating, in any portion of the ovary, extend into the peritoneal cavity, Fallopian tube, uterus, bladder, vagina, rectum, perineum, appendix, intestinal canal or externally into the soft structures or through the skin, anywhere about the pelvis.

SYMPTOMS.

Symptoms such as obtain with *ovaries* even when aggravated by profound pathology are very indefinite. This is especially so with the earlier manifestations, which are so often slight in character, and because the nerve fibers are from the same source and intimately associated.

Pain having its origin in one would be reflected to the other and thus involve the uterus and surrounding structures which are also dominated by branches of the pudic.

This being so, primary pain of one structure would become secondary with others, especially the Fallopian tubes and uterus.

Local disturbances in the *ovaries* are in the form of pain and tenderness, sometimes induced by the sense of touch. Like their analogue the testicles, they are more sensitive than any other tissue in the uro-genital tract, and their sensitiveness increases with pathology. Their irregularities, therefore, are more readily reckoned with and defined, especially when general disturbances are manifested. Pressure upon a normal ovary will induce tenderness, pain, chill, headache, shock, nausea and vomiting. It is therefore apparent why they are so greatly influenced by pathology within them or their adjacent structures or those far distant within the pelvis or perineum, that possess the same nerve supply. The very great variety of conditions to which the ovaries are subjected, produce symptoms identical in character thus rendering it impossible to identify any one of them.

CHAPTER XXIV.

FALLOPIAN TUBES.

ANATOMY.

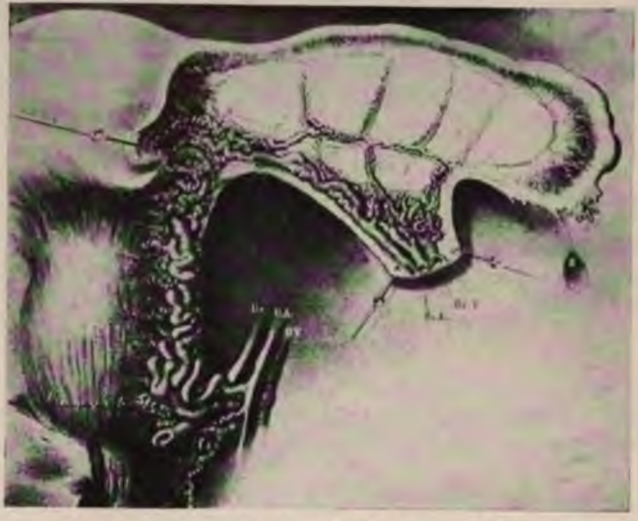


Fig. 56.—Fallopian tube and blood vessels (Kelley).

FALLOPIAN TUBES are composed of the muscular, mucous and submucous coats, lined with epithelium and covered with peritoneum. The circular muscle fibers are more numerous near the uterus. The mucous coat is covered with ciliated epithelium, arranged for driving the contents of the tube toward the uterus with which the epithelium is continuous, and extends to the fimbriated end of the tubes where they join the peritoneum.

Blood vessels are from the uterine artery and branches of the ovarian artery and the veins connect with the uterine and ovarian veins.

Nerves are derived from the plexus that supplies the ovary and that which connects with the uterus. Afferent fibers appear to belong to the eleventh and twelfth thoracic and the first lumbar nerves.

The lymphatics join the lumbar group of glands.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, in form, size, length, relation to other structures, entrance into the uterus, blood, nerve and lymph supplies, or one or both entirely absent or imperforate.

DISEASES.

Benign. Malignant.

BENIGN.

Inflammation may be primary or secondary, acute or chronic, local or general, mild or severe.

Tuberculosis may be primary or secondary, local or general, single or multiple, acute or chronic, in any of the tissues or portion of the tube, become arrested, disappear or continue to destruction.

Syphilis may be congenital or acquired, primary or secondary, single or multiple, local or general, arrested, disappear spontaneously or continue in its destruction.

Papillomata may be congenital or acquired, primary or secondary, single or multiple, with or without pedicle, in any portion of the tube, remain quiescent, disappear or continue to grow.

Adenomata may be congenital or acquired, primary or secondary, single or multiple, usually without pedicle, in any portion of the tube, remain quiescent, continue to grow, or disappear spontaneously, though this seldom occurs.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape and location, continue to grow, remain quiescent or disappear spontaneously.

Pregnancies may be primary or secondary, single or multiple, in any portion of the tube, develop to about the sixth week before which time they invariably rupture to escape into the peritoneal cavity, broad ligament, uterus, bladder, intestinal canal, rectum, or vagina, become encysted in the broad ligament where they may die and remain indefinitely or develop to maturity, and then die, and remain indefinitely.

Cysts may be congenital or acquired, primary or secondary, single or multiple, acute or chronic, vary in size, contain blood, pus, serum, echinococci, colloid or dermoid material, rupture into the broad ligament, peritoneal cavity, uterus, bladder, rectum, vagina, perineum, intestinal tract or soft tissues, through the cutaneous structures anywhere about the pelvis.

Fistulæ may be congenital or acquired, primary or secondary, single or multiple, open into the uterus, peritoneal cavity, bladder, vagina, rectum, perineum or through the external soft structures.

Prolapse may be congenital or acquired, primary or secondary, single or multiple, behind the uterus, into the vaginal vault, with other tissues, or complicated with various inguinal, femoral and ventral herniæ the same as ovaries.

MALIGNANT.

Carcinomata may be primary or secondary, usually primary, in any portion of the tube, unilateral or bilateral, and extend into the broad ligament, uterus, or ovaries.

Sarcomata may be primary or secondary, usually primary, single or multiple in any portion of the tube, unilateral or bilateral, usually unilateral.

INJURIES.

Incisions, punctures, ruptures may be primary or secondary, single or multiple, vary in size and location, by accident or design, complete or incomplete, extend into the peritoneal cavity, uterus, bladder, rectum, vagina, or the overlying soft structures.

Foreign bodies, though small, may enter the Fallopian tube through the uterine canal, the wall of the tube by way of the peritoneal cavity, the rectum, vagina, or through the overlying soft structures.

SYMPTOMS.

Symptoms due to Fallopian tube disturbances are very similar in character to those of the ovaries and uterus because of their close proximity and intimate relation of nerves. Their similarity is so great that instances are few where they can be defined, the element of doubt always existing.

Local tenderness and pain are the earlier manifestations and while they may gradually increase in severity until the general manifestations assert themselves they are not definite.

Symptoms are alike with all conditions of the tubes and their adjacent structures and for this reason cannot be made specific, nor can they be differentiated from conditions in their adjacent structures except in a few instances when their symptoms predominate

CHAPTER XXV.

RECTUM.

ANATOMY.

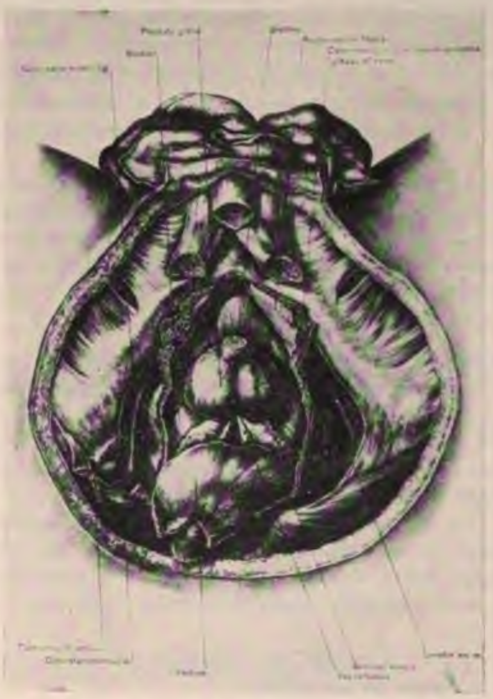


Fig. 57.—Pelvic organs seen in dissection of male perineum (Deaver).

THE RECTUM is seven inches long and extends from the sigmoid to the external sphincter ani, and its *first portion* ending in front of the tip of the coccyx and bending somewhat backward. In front of the upper portion of the rectum are the perineum, bladder, seminal vesicles, vasa deferentia and prostate in the male and vagina in the female.

The *second portion* extends from the tip of the coccyx and is almost entirely encircled by the internal sphincter ani muscle, and not covered with peritoneum. The distance from the internal sphincter to the meso-sigmoid is four inches.

The cylinder in the upper portion though about two inches in diameter may be distended to four or five inches with feces or the hand without rupture.

External sphincter ani muscle arises from the coccyx and extends to the anus, sometimes to the bulbocavernosi muscle. It is composed of striated fibers which lie directly beneath the skin and its purpose is to open and close the anal orifice and to fix the anterior tendon of the perineum during contraction of the bulbocavernosi, some fibers completely surrounding the anus. In the female a few decussate with those of the sphincter vaginæ and nearer the outside circles than the internal sphincter. The anterior fibers pass along the sides of the prostate and vagina. The middle fibers blend with the longitudinal fibers of the rectum and extend to the sphincter ani and the posterior fibers join the other lavatori to become inserted at the tip of the coccyx.

Blood supply is the *superficial perineal artery* which is a branch of the internal pudic, given off just before it enters the space between the layers of the triangular ligament of the perineum. It is sometimes termed the *transverse artery* of the *perineum*.

The fourth sacral and inferior hemorrhoidal nerves supply the external sphincter ani muscle. Some fibers coming from the pudic and inferior mesenteric and pelvic plexuses, arise from the fourth sacral and inferior hemorrhoidal branch of the pudic and they in turn connect with the small sciatic, pudic and fourth sacral nerves.

The inferior hemorrhoidal nerve usually branches off the pudic after it passes through the lesser sacro-sciatic foramen and supplies the external sphincter, cutaneous filaments to the perineal integument and communicating branches of the inferior pudendal and superficial nerves.

It is thus seen that it has three important branches, the inferior hemorrhoidal, perineal and dorsal nerve of the penis and clitoris, the main trunk having passed forward in Alcock's canal in the obturator fascia. With the change from cloacal to the true mammalian condition, the pudic trunk was necessarily split into many twigs, it no longer answering the purpose for which it was first intended.

Levator ani muscle is composed of three sets of fibers.

Anterior, pass along the side of the prostate and vagina.

Middle, blend with the longitudinal fibers of the rectum and extends to the sphincter ani.

Posterior, join the other levator ani to be inserted into the tip of the coccyx. The entire muscle is supplied by the inferior hemorrhoidal and fourth and fifth sacral nerve, and its function is to raise the pelvic floor and fascia.

Blood Supply. The levator ani, obturator internus, pyriformis and coccygeus muscles are in part supplied by the gluteal. The pyriformis and coccygeus also receive branches from the lateral sacral artery. The sciatic artery also sends branches to the pyriformis, levator ani and coccygeus muscles, and the obturator receives a branch from the internal pudic artery.

The recto vesical fascia's principal function is to prevent pus and extravasated urine from passing from the perineum to the pelvis.

Blood supply of the rectum is from three hemorrhoidal and middle sacral arteries, the most important of which is the superior hemorrhoidal, which is the prolongation of the inferior messenteric trunk, which after reaching the rectum from the meso-colonic root, divides into two chief branches which course around the sides of the rectum anteriorly. Many of its small branches then perforate the rectal muscular fibers to supply their mucous membrane. The superior and middle hemorrhoidal anastomose both externally and internally to the rectal wall.

The inferior hemorrhoidal artery pierces the inner wall of Alcock's canal, and runs obliquely forward and inwards. It soon divides into two or three main branches, which sometimes arise separately and pass across the space to the anal passage. The artery anastomoses in the walls of the anal passage with its fellow on the opposite side and with the middle and superior hemorrhoidal arteries. It also anastomoses with the transverse perineal arteries and supplies cutaneous twigs to the region of the anus, and others turn around the border of the gluteus maxims to supply the lower part of the buttock.

Nerve supply is from the sympathetic twigs which are derived from the inferior messenteric and hypogastric (sometimes called pelvic plexus) and cerebrospinal system, fibers of which arise from the second, third and fourth sacral nerves. Fibers of the inferior hemorrhoidal branch of the internal pudic nerve (third and fourth sacral) are also distributed to the lower part of the anal canal and external sphincter. The second, third and fourth sacral nerves convey motor impulses to the longitudinal fibers but also inhibits impulses to the circular muscular fibers.

Fibers from the sympathetic also convey motor impulses to the circular muscle and inhibitory fibers to the longitudinal muscles of the rectum.

The *reflex center* which governs the action of the sphincter and the muscular fibers of the rectum (defecation center) is situated in the lumbar region of the cord and appears to be capable of carrying out the whole act of defecation even when separated from the brain.

Lymphatics of the rectum pass to the glands on the front of the sacrum and some in the lower portion of the anal canal join the lymphatics around the anus and pass with them to the oblique set of the superficial inguinal glands, a few from the lower portion of the rectum are said (Quenu) to join the iliac glands but these are not constant according to Gerota.

ETIOLOGY.

Anomalies, Diseases and Injuries.

Anomalies.
Diseases { Benign.
Malignant.
Injuries.

ANOMALIES.

Anomalies may be congenital or acquired, primary or secondary, single or multiple, in any portion, vary in length, diameter and uniformity of lumen, position and relation to other structures, a part or all of the rectum absent, and the anal opening behind, in the vagina, bladder, urethra, uterus, peritoneal cavity or absent.

DISEASES.

Benign. Malignant.

BENIGN.

Benign diseases are of many kinds and varieties and may occupy any portion of the cylinder. They may be congenital or acquired and vary in size and rate of growth.

Proctitis may be primary or secondary, acute or chronic, local or general, mild or severe.

Ulcers may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, result from infection or pressure, necrosis, extend partially or completely through any portion of the rectal wall especially in the lower third of the cylinder.

Fissures may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in depth, length and width in one or all of the tissues of the wall, location, almost invariably external or between the sphincters. Their most frequent cause is the passage of such a mass through one of normal tension, or the presence of cicatricial tissue.

Fistulæ may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, extend into and through the perineum, posterior soft structures, urethra, bladder, prostate, vagina, uterus, or peritoneal cavity, vary in size, length and location, straight or tortuous.

Varicosities such as hemorrhoids, angiomata and aneurysms may be congenital or acquired, primary or secondary, acute or chronic, in one or more vessels or any portion of the rectum, vary in size and sometimes disappear spontaneously.

Papillomata are of the more common varieties found within the rectum and they may be congenital or acquired, primary or secondary, single or multiple, usually multiple, located anywhere upon the mucous membrane and develop to a considerable size, usually with pedicle. (See Papillomata and Adenomata of the Rectum, *N. Y. Med. Jour.*, Vol. LXXX, 1907, also Papillomata and Adenomata, Hist. Review, AMER. JOUR. OF DERMATOLOGY, March 1, 1908. (Ricketts.)

Adenomata may be congenital or acquired, primary or secondary, single or multiple, upon any portion of the inner surface of the rectum, vary in size and shape, remain quiescent, continue to grow or disappear spontaneously. They usually have a broad base and appear most frequently in the lower half of the cylinder.

Tuberculosis may be primary or secondary, acute or chronic, single or multiple, vary in size, be upon any portion and in any tissue, but usually in the lower third of the cylinder and extend into the surrounding tissues.

Syphilis may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, vary in size, in any tissue or location and usually in the lower third of the cylinder, sometimes disappears spontaneously or cause total destruction of any part or all of the rectal wall in the form of gumma.

Fibromata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, location, in any tissue, usually in the lower half of the cylinder.

Lipomata may be congenital or acquired, primary or secondary, single or multiple, vary in size, shape, location, in any tissue but usually about the middle of the cylinder.

Prolapsus may be congenital or acquired, primary or secondary, acute or chronic, one of four degrees. Hyperexertion to stool when the lumen of the rectum has been lessened by any cause and when the sphincters have relaxed unduly are the most common causes.

Infection may be primary or secondary, bacterial or parasitic, local or general, mild or severe, acute or chronic, and result in abscess within the rectal wall or any of the adjacent tissues or organs.

Cysts may be congenital or acquired, primary or secondary, acute or chronic, single or multiple, in any portion or tissue, contain blood, pus, serum, echinococci or dermoid material, rupture posteriorly through the soft structures, into the vagina, rectum, perineum, urethra, uterus or peritoneal cavity.

Strictures may be congenital or acquired, primary or secondary, acute or chronic, partial or complete, single or multiple, in any portion of the rectal wall.

Parasites may be congenital or acquired, primary or secondary, single or multiple, remain indefinitely with or without producing inflammation, encysted or within the open cavity.

Foreign bodies may enter from without or within, through the anus or mouth, vagina, bladder, uterus, peritoneal cavity or external soft structures.

Feces may be hard or soft in consistency and either form cause great rectal or constitutional disturbances. If the normal diameter of a mass normal in consistency, is lessened from any cause at a given point distant to the sphincters, the pressure upon them will not be normal in uniformity or degree because the line of perpendicular will have been changed. Thin or watery stools are probably exceptions to this rule and an empty gut significant of quietude.

These remarks apply to both sexes but because of the difference in their anatomical relations the same rules for classification do not obtain. In the male the fecal mass is pushed forward against the prostate, seminal ducts and urethra while in the female this force is forward against the vaginal wall and uterus.

MALIGNANT.

Malignant diseases are of two kinds with their respective variations. Those sarcomatous in character are less frequent and usually of secondary origin. The carcinomata are more common and as a rule primary in origin. Either variety may occur upon any portion of the rectal wall or mucous membrane, always single and more frequent in the lower half of the rectum and more often in the male in whom ulcer is more common.

Carcinomata may be primary or secondary, single or multiple, in any tissue or portion of the rectum, usually single, and appear most frequently on the mucous membrane immediately overlying the tip of the coccyx.

Sarcomata may be primary or secondary, single or multiple, usually single, in any tissue or portion of the rectal wall.

INJURIES.

Ruptures.
- Laceration.
- Incision.
- Puncture.

Rupture of the rectum may assume one of three varieties, laceration, incision and puncture and each vary in extent, number and position, partial or complete, through the rectal wall or when complete, extend into the surrounding soft structures, vagina, uterus, bladder, peritoneal cavity, urethra, seminal vesicles or prostate.

SYMPTOMS.

Rectal Reflexes and Neuroses. (By H. C. Von Dahm, M. D.)

The consideration of rectal reflexes and neuroses leads to anatomical fields sometimes far removed from the rectum, and again to fields so intimately associated with that organ, not only anatomically, but from symptomatic and pathologic standpoints, that the subject becomes a vast one and of no little importance.

The close association of the rectum with the genito-urinary system makes the successful study of either one necessarily lead to a consideration of the other. Especially is this true as to the *neurotic* manifestations of their pathology.

A review of the nerve supply of the rectum shows its innervation derived from both the sympathetic and spinal systems with a predomination of the sympathetic.

This system supplies numerous filaments from the *hypogastric*, *sacral* and *mesenteric* plexes, while the spinal element is derived from the third, fourth and fifth sacral nerves. In their distribution the two nerve elements become intimately interwoven. The *spinal* nerves in their course to the rectum, pass through the sacral plexus of the sympathetic and are distributed to the striated muscles, the levator ani and external sphincter, thence to the perineal skin and the modified epithelium of the *anorectal* region as far up as the anorectal line. Above this line we find only sympathetic distribution, the voluntary control of the rectal function ceases and becomes an *automatic* one, entirely under the control of the sympathetic.

The perineum, prostate, urethra, bladder and vagina receive a great part of their spinal and sympathetic nerve supply from the same source as the rectum and anus, which fact accounts for the various reflexes between the rectal and genito-urinary systems. Any pathological condition of the rectum may give rise to genito-urinary symptoms, while many times genito-urinary lesions have their symptoms referred to the rectum.

This rule obtains with both sexes though more frequently and numerous in the male and of a more severe and complicated character because the genito-urinary system of the female is less complicated in its arrangement.

Rectal disturbances are factors that always necessitate consideration, especially when the male reproduction organs are disturbed. They are so intimately associated and complex, that it is often impossible to discover their cause or origin, but such a difficulty is not so likely to be encountered when the rectum in the female is primarily disturbed, because for want of so close a proximity of the two tracts as exists in the male. The same might be said about the urinary apparatus in the female because of the absence of complexity.

While symptoms of rectal conditions are quite significant, those of the sigmoid are intimately associated because their distinction is but imaginary, one being an extension of the other.

From the studies of various investigators and anatomists, we draw the conclusion (a) that the innervation of the pelvic viscera is derived chiefly from the sympathetic or is greatly controlled by it.

(b) That the innervation for both *automatic rectal* and *automatic vesical* function is situated entirely in the sympathetic;

(c) That the spinal cord in its relation to the pelvic viscera is simply the pathway for *sensory* impulses to the brain and for cerebral impulses controlling their *voluntary* functions.

(d) That the two systems are intimately joined by the rami-communicantes of the lumbar and sacral segments of the cord.

Only by the consideration of these facts, are we able to grasp the far-reaching but withal closely related reflexes and neuroses of the pelvic viscera.

Rectal reflexes may arise from (a) areas innervated by the spinal nerves, (b) by the sympathetic, or (c) by both systems.

The close *association* of the two systems often makes it impossible to definitely state that a reflex arises entirely from one system or the other. Generally speaking, however, we may say that the *spinal* factor is represented in all areas where stimuli can be *recognized* and *localized* by the patient, while the *sympathetic* factor may affect *distant* points, the local stimulus not being recognized except as *referred* pain at some point of spinal distribution.

We may conclude, therefore, that these reflexes may be manifested by (a) motor spasms, (b) by sensory disturbances, (c) by alterations in secretion or (d) by any combination of these three results.

The most familiar rectal reflex and the most neglected one is that of defecation. Here we have the *motor element* represented by the contraction and relaxation of the striated muscles of the pelvis and the abdominal muscles; the *sensory disturbance* manifested by peripheral nerve stimulation at the anal papillæ from contact with the feces; and the *secretory element* by a further secretion by the rectal mucosa. The desire for stool comes on when pressure on the muscular coats of the rectum, on the levator ani and pelvic wall creates a sense of fullness; this is sent to the sympathetic ganglia as an *afferent impulse*, is returned as a strong efferent impulse and causes contraction of the *involuntary muscles* of the rectum.

In addition to this impulse another is created at the *anal papillæ* by the mass coming in contact with their extremely sensitive surfaces. This generates the *motor impulse* and the voluntary muscles do their part. This short reflex would result in *automatic* evacuation were it not overcome by the *voluntary* contraction of the external sphincter and levator ani muscles. The reflex is kept up however, to exhaustion, and as it becomes exhausted, the desire passes. Neglect of this reflex demand of nature, we know is one of the basic causes of so-called "*habit*" constipation.

As said before, were it not for the power of voluntary *inhibition*, the act of defecation would be entirely *automatic*, the rectum emptying itself as soon as the efferent sympathetic impulses were of sufficient strength to generate *motor* impulses. In addition to this automatic power the rectum exhibits a marked tendency to *periodicity* in the exercise of its function.

If inhibition of the efferent motor impulse is the basic cause of "*habit*" constipation, here then we have the simplest cure. Coincide with the reflex of *automaticity* and *periodicity*, thus creating a "*habit action*" and the "*habit constipation*" is removed. This, of course, is true only when the reflex arc is unimpaired by lesions of its centers.

Anal fissure is a condition giving rise to many neuroses. There is at first a *spinal reflex* evidenced by the contraction of the external sphincter at the time of defecation or upon digital examination. (The spasm is much more marked than the simple anal reflex —this latter, after a short time, becoming much accentuated). Later when the irritation from the fissure becomes more severe a *mixed* reflex is developed, with much pain either at the *time* of stool or immediately following. This causes an *involuntary reflex contraction* of the sphincter, which cannot be voluntarily relaxed. We must remember that the external sphincter must be *relaxed reflexly*, but that it may be *contracted* both *reflexly* and *voluntarily*.

The spasmodic contraction of the sphincter so depletes the blood supply of the fissure and irritates the exposed nerve endings to such a degree that reverse reflexes are set up. The pain may now be referred to the *sacrum*, *prostate*, the *ovaries* or the *bladder*. It may even travel down the thigh, or follow the distribution of the fourth and fifth sacral nerves. Intestinal disturbances may arise such as flatulence, or vague diffuse pain. These reflexes may be explained as may all complex neuroses of this region by the contiguity of their spinal and sympathetic centers. A *thrombotic hemorrhoid* may give rise to similar symptoms.

One of the common reflexes of *internal hemorrhoids* is a *pain* and *sense of weight* in the floor of the pelvis, or sometimes it is referred to the *sacrum*. This may be explained, as the result of the congested rectum pressing upon the levator ani muscles or upon one of the nearby sacral nerves.

Anal pruritus gives rise to a number of neuroses, of which itching is the most prominent. This reflex is observed in the perineal skin and in the modified skin lining the anal canal as far up as the crypts. This symptom is due to irritation of those nerves capable of carrying *tactile sensation* and not those which convey *painful* stimuli. Local anesthetics will neutralize *painful* skin sensations in this region but will not stop the itching of a true pruritus. Another neurosis in this condition is a sensation of *crawling*. This is due to irritation of the same nerve endings. An illustration of the *secretory type* of reflex sometimes present in anal pruritus is *perineal sweating*. This symptom has also been noted in cases of great nervous excitement and in *fecal impaction*.

Ordinarily, sensations of *moisture* or *dryness* are felt only in the anal and perineal skin. However, when the pathology causing these conditions is situated either in the rectal ampulla or at the anorectal line, the sensation to the patient is at the point of *irritation* and not where the moisure or dryness *exists*.

A cryptitis may produce more disturbances of spinal sensation and motor function than any other rectal lesion. The resulting neuroses are legion and may be explained by the complicated and interwoven nerve supply to the crypts and to the papillæ in immediate relationship. So profound does this irritation become that a *mental exhaustion or extreme emotional irritability* has been noted and from no other cause.

Persistent vomiting is a neurosis, which may result from *impacted feces* in the rectum or colon. *Retained flatus*, *tumors* and *strictures* of the rectum, especially when they are high enough to press upon the *peritoneum*, may give rise to pain which may be referred to the *appendix*, the *bladder* or *ovaries*.

Lesions above the ano-rectal line are not so liable to cause so many complicated neuroses as are those situated *below* this highly sensitized region. This is true also of *extra-rectal* lesions involving the loose tissue immediately around that organ. It has been a much discussed question, if the mucosa of the rectum proper is at all supplied with *sensory* nerve endings. It has been demonstrated that ulcers may be cauterized without *localized* pain to the patient; that *hemorrhoids* may be removed without an anesthetic and that sensations of heat and cold cannot be detected unless they come in contact with the spinal innervation at the ano-rectal line. *Carcinoma* of the rectum develops no pain that can be localized until it involves the *voluntary* muscles of the pelvis or pelvic wall. This may be why so many rectal carcinomas reach an inoperable stage before their presence is discovered. This absence of *localized pain* is noted also in *suppurations* outside the rectum. Unless they involve some one of the structures named or press upon a nerve filament their presence is often unsuspected.

There are a number of neuroses that occur *without* the presence of *pathology* in tissue. A patient may complain of vagus symptoms of uneasiness or pain in the region of the anus and upon examination we find everything normal. Perhaps a few minutes later *another* examination will disclose a sphincter in the extreme *spasm*. We must necessarily account for this as pain due to muscular contraction from some *central* lesion and not to peripheral irritation. This may in time produce marked *systemic* and *mental* phenomena. Or on the contrary, undue sphincteric *dilation* may produce phenomena just as profound. It is not uncommon in highly sensitive individuals to find a condition bordering on *nervous exhaustion* following a constipated stool. The systemic effect of *divulsion* of the sphincters is very evident. The heart action is increased, blood pressure is raised, the respirations become deeper, the capillaries are flushed through excitation of the vaso-motor center and profound nervous phenomena are produced.

Following divulsion of the sphincters, we sometimes find the internal sphincter in a state of *contraction* and doing the work of both. Sahli calls this condition "vicarious contraction," while Cook gives it the name of "compensatory contraction." It may be explained by the voluntary contraction of the levator ani and glutei stimulating a sympathetic reflex which is referred to the internal sphincter.

In a consideration of neuroses of the rectum, we must differentiate between diseases of that organ with referred pain in *extra* rectal structures and pathological conditions, which are *extra rectal*, but producing rectal symptoms. In addition to their local symptoms, peculiar to the lesion, prostatitis, seminal-vesiculitis, urethral stricture, various lesions of the bladder, renal calculi, and ovarian or uterine inflammations may exhibit a very marked pain in the rectum or sacrum. These symptoms are often ascribed to some slight *rectal* lesion and the *real* cause overlooked. Especially is this true of uterine or ovarian displacement. Illustrative of this, a retroverted uterus may produce a *mucoid proctitis* or *hemorrhoids*. Treatment of these conditions would afford only temporary relief at best while correction of the displacement would bring about permanent benefit.

Lesions of the central nervous system, which interfere with the transmission of motor or sensory impulses are often exhibited in the rectum. Allingham says: "In the beginning of various forms of mania one often observes that the patient has severe pains in the rectum without any pathological lesion to account for the same." *Locomotor ataxia* shows *early* rectal symptoms such as constipation, paroxysmal pain, lessened irritability of the sphincters and loss of sensation in the perineal skin. Later we may have a loss of the *voluntary* or *reflex* control of the bowel. When this last occurs, a *vicarious* condition is produced, as the *automatic* control is not lost so early, and we have a *constipation* with *incontinence*. Acute transverse myelitis results in early *paralysis* of the rectum and bladder, while in the lateral sclerosis, we observe increased sphincteric rigidity and reflexes.

A review, such as this paper is intended to be, would be far from complete without a reference to the effect of rectal pathology on the general health of the individual. There is hardly a lesion of the rectum that does not have its effect on the general nutrition. Many of them go farther and make their influence felt on the mind as well. Especially is this true in individuals of a nervous temperament. It is surprising the amount of mental relief afforded by a successful treatment or operation upon a rectal lesion. Whether the condition before treatment was psychical or physical, the feeling of depression is thrown off and the patient is afforded mental and physical relief sometimes out of all proportion to the pathology removed.

A rectum distended with gas or feces may cause painful disturbances alike throughout the uro-genital and rectal tracts, because of the excessive pressure upon the seminal vesicles and prostate glands, so rich in sensory nerve filaments.

Highly acidulated feces or a bladder distended with urine, or containing a highly acid urine, will cause the desire to urinate, defecate or copulate. Constipation and diarrhea may be the result of such a condition and is, no doubt, frequently the cause of the uterus discharging prematurely its fetal contents.

Rectal irritation in certain individuals of either sex, may produce greater sexual excitability than the same degree of irritation to the sexual organs alone, and irritation of the sexual organs may cause a desire to defecate and irritation to either may cause frequent desire to urinate, thus demonstrating the intimate relationship of their nervous impulses in both health and disease.

It may cause the loss or increase of sexual desire and sometimes be associated with dull pain of a bearing-down character, which is so frequently reflected to the coccyx and pain in the loin about the buttocks and sometimes down the thigh.

Alimentary function may remain normal or be disturbed by the various rectal conditions and their complications in the form of nausea, vomiting, eructation, acid stomach, flatulence, constipation, diarrhea and distention.

They may be mild or severe or of short or long duration.

The *appetite* may be impaired by infection due to any cause and its impairment increases with the degree of infection or irritability.

CHAPTER XXVI.

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